JPRS-ESA-84-022

10 July 1984

East Europe Report

SCIENCE & TECHNOLOGY

CZECHOSLOVAKIA: COMPUTER TECHNOLOGY EXAMINED

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS-ESA-84-022

10 JULY 1984

EAST EUROPE REPORT

SCIENCE & TECHNOLOGY

CZECHOSLOVAKIA: COMPUTER TECHNOLOGY EXAMINED

FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and characteristics retained.

Headlines, editorial reports, and material enclosed in brackets are supplied by JPRS. Processing indicators such as (Text) or (Excerpt) in the first line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U. S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U. S. Government Publications issued by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available through Bell & Howell, Old Mansfield Road, Wooster, Ohio, 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS-ESA-84-022

10 July 1984

EAST EUROPE REPORT

SCIENCE & TECHNOLOGY

CZECHOSLOVAKIA: COMPUTER TECHNOLOGY EXAMINED

CONTENTS

SELECTIONS ON COMPUTER TECHNOLOGY IN CSSR

Seminar on Management Automation

Bratislava INFORMACNE SYSTEMY in Slovak No 4, 1983 pp 392-394

[Article by Pavol Dujnic and Milan Fundarek: "Automation Trends in Management"]

[Text] Under the above title a seminar organized in cooperation with the plant branch of the Czechoslovak Scientific and Technological Society by the Computer Research Center in Bratislava took place on 7-10 March 1983 in Piestany as the first undertaking of this orientation in our country. Its objective--as pointed out in his introductory address by the research center's director, Prof Eng A. Klas, CSc--was to convoke a specialized forum where personnel dealing with problems of automation in management could share findings made in past development and attempt to formulate the key factors affecting the application of automation in the management of social processes as well as the future directions of its development. He emphasized at the same time the work-oriented nature of the seminar, to culminate in promoting the application of findings and of information in preparation of long-term outlook plans in the automation of management, whether for the use of the institutions themselves or for that of top organs of management.

The seminar was attended by 48 specialists, primarily from scientific and research centers; the 26 lectures presented were thematically oriented toward:

--the identification of prospective demands of management on automation (6 presentations);

--directions for the application of automation at individual levels of management (9 presentations);

--directions for the development of computer hardware and software (6 presentations);

--socioeconomic aspects of the application of automation (5 presentations).

Several generalized ideas and conclusions can be deduced from the presentations and from the discussions.

This involves, first of all, clarification of the functions and position of automation in management. Practically all the presentations--dealing with various aspects of this problem (Pernica, Klas, Tondl, Kozacik)--emphasized the idea that automation cannot be interpreted as an isolated phenomenon or a specific service, but that it involves participation in the development of society as a whole. Thus, continued development of automation can be considered only in the context of overall economic and social development. The process of automation is distinctly affected by such factors as: the system of management, valid organizational structure, the existing political, economic and social system. Consequently, socioeconomic development creates on the one hand conditions conducive to the development of automation, while on the other hand it also creates limitations to its development.

A complete consensus of opinion was found in presentations (Klas, Wollner, Pernica, Klima, Kacir) and in discussions with regard to the area of applications of automation in management. It was stated that improved effectiveness of management calls for a more emphatic application of automation in the decisionmaking process, introducing it into the center of management and utilizing it more systematically in making the efforts of the management sphere more efficient. The application of automation should ultimately become reflected in more effective managerial decisions which would form the basis for improved effectiveness of administration and in final outputs from the objects of management.

Considerable attention was devoted to the problem of what constitutes the key approaches to the application of computer technology in decisionmaking processes and how conducive the conditions are to improving its efficiency. The presented suggestions can be classified into the following orientations:

--formalization of decisionmaking processes;

--improvements in ready availability of data, methods (algorithms) and computer technology itself;

--direct relation between user and computer technology.

The key factor in promoting the introduction of automation into management was seen in the formalization of the decisionmaking process (Klas). Gaining a thorough understanding of this should contribute toward creating conditions conducive to:

--criterial orientation of decisionmaking (formalization of assignment of priorities to socioeconomic objectives);

--variability of decisionmaking (formalization of various changing conditions as they affect economic development);

--comprehensiveness of decisionmaking (formalization of the dynamics of economic phenomena, their causal relationships and feedbacks);

--precision of decisionmaking (formalization of the decisionmaking process).

Meeting of all these requirements calls for the generation of a system of models, the application of simulation techniques, and the devising of multistage-type models and scenario techniques.

The successful application of computer technology depends largely on how possible it is to identify decisionmaking processes and introduce models into key decisionmaking stages. The seminar's presentations also included integrated methodological concepts of the system's decomposition and analysis (Wollner).

The area of formulation of plans for the national economy was regarded as the area where promotion of the efficiency of decisionmaking processes should find priority application. The technical base of the new technology of management should be used primarily in providing balance and variability for long-term plans (Pirko).

Several topics were also oriented toward improving the technology of planning by transition to interactive planning on two levels and establishing linkages along vertical and horizontal lines (Tesar).

With regard to improvements in the ready availability of data, methods (algorithms) and computer technology itself, the basis was seen in the creation of conditions for operation in real time (Kacir). Real time is to be interpreted herein as the time which elapses between the time a problem crops up and the need for making a decision arises; it differs at the macro- and micro-levels. The approach to improved ready availability of data was seen primarily in the establishment of data banks, and systems of data banks. Improved ready availability of data was viewed at the same time in a wider context, namely as a system tied not only to the data of a user's system, but also to data of other information systems (Pirko). From this requirement follows the need for devising local and long-distance data transmission, dealing with problems of integrated thematic contents, particularly at the level of top information systems (SEI and IPSR), the need for devising metainformation systems (SEI and IPSR), the need for devising metainformation systems and their mutual interconnection (Laitl). Improved ready availability of methods also calls for providing suitable means, such as libraries and banks of methods. The range of methods and models stored in them should permit the conduct of basic analytical and prognostic operations. Improved ready availability of computer technology itself means devising configurations, software and organization prerequisites to be at the user's disposal when needed for required operations involving data.

Practically all of the lecturers linked the application of the specified possibilities for the utilization of computer technology to a change in the manner of communication between managerial personnel and computer. This involves replacing intermediary communication through a programmer by direct communication based on availability of terminals, a "user-friendly" language and a user provided with special training, willing to change his style of working and capable of overcoming psychological barriers that objectively occur in the user's work with the computer.

A wider and more effective application of automation in management will be determined by the continued development of the hardware and software components of computer technology. Plander, Jirina, Pelouch--as well as others--pointed out in their presentations the directions for development of computer technology in the area of large computers (JSEP [Uniform System of Electronic Computers]) as well as mini- and microcomputers (SMEP [System of Small Electronic Computers]).

Within JSEP the near future will bring the introduction of "fifth generation" computers. Innovation of these computers, the so-called "sixth generation," is currently underway. Among them, the Czechoslovak EC 1026 computer passed international tests last year, and the EC 1036, EC 1046, EC 1056 and EC 1061 (innovated version of EC 1060) computers will undergo international tests, for the most part, in 1984.

Extraordinary attention is devoted to improving the output capacity of computers. It can be envisioned that through progressing integration it will be possible to attain a median computer capacity in excess of 1 million operations per second as early as 1986-1987. In the latter half of the 1980's the capacity of all-purpose JSEP computers will reach about 10 million operations per second.

The development of specialized processors can be regarded as another direction in improving JSEP. In the area of data processing, the development of data-base processors and data-base computers oriented toward providing technical aid in devising a relational model of the data base is expected.

The most significant trend in the sphere of external memory is considered to be the abandonment of paper media and their replacement by magnetic recording and direct communication between man and computer by means of a display screen. Prognoses hold that disk memory will remain the key type of large-capacity memory till at least the year 2000. Building the COM data transmission processor into JSEP computers of Czechoslovak production will facilitate the connection of displays and terminals. The trend toward graphic and color information display is shown in the case of display screens and printers by the application of graphic systems, such as, e.g., the EC 7941 and EC 7942.

New possibilities for improving efficiency in management are provided by mini- and microcomputers. The development and production of SMEP computers will within a short time increase variability in the application of computer technology, expand its scale of application and its improved reaction to the specific conditions in the requisite applications.

With a view to the future, emphasis is concentrating on completion of the development and production start-up of SMEP II. The development of SMEP III will commence as of 1984. Presentations (Plander) included descriptions of the properties of five classes of SMEP II computers, specifically the SM 50 microcomputer, SM 51 emulative computers, SM 52 high-capacity minicomputers, SM 53 multiprocessors and multicomputer complexes, and SM 54 specialized problem-oriented computers.

A presentation describing a Japanese project for computer systems of the fifth generation, the design of which is to be completed in 1990, aroused much attention.

Less often discussed at the seminar were problems of software development. From what was stated (Pelouch, Drechsler, Kesner), it can be expected that additional improvements will involve the functional and economic aspects of operational systems under Czechoslovak conditions, particularly DOS [Disk-type Operational Systems]. No basically new philosophical approaches are expected in the near future in the design of systems for data base control, other than improvements in the relational models of existing systems. New design types will come to the fore in various areas of application, tabular, dialogue and graph generators. Nothing is occurring in the development and application of new types of general programming languages. A significant advance is expected in the development of languages promoting direct communication by managerial personnel.

The development of microcomputer and minicomputer systems leads to the expansion of their area of application. One such new area of application is the automation of administrative operations. Office applications of computers help to improve the efficiency and quality of the work performed by administrative centers. They represent a wide scale of systems, from simple systems for text processing up to the forming of integrated office systems which facilitate the processing of audio, textual and video information. The necessary prerequisite for integration is the existence of local networks providing the prerequisites for cooperating among various units of an organization.

The presentations by Lamacka, Saf and Manuelianc outlined in adequate scope the potential applications of small computers in administration, the trends at the hardware, software and methodological levels oriented toward such applications.

Several of the presentations voiced the requirement for a more systematic monitoring of the sociological, legal, ethical and economic consequences of automation (Pernica, Tondl, Knapp, Ehlemann). They cited several examples of the consequences of automation in the area of social division of labor. A need for new specialized professions (designers of automated systems, analysts, programmers, systems engineers and others) is appearing. Under the impact of automation changes in the contents of qualifications in other professions are occurring. This produces the need for devising a modern concept of specialized training of managerial personnel (Pernica, Knapp, Wollner).

Another aspect of the development of automation that must be dealt with at all its stages--from intent, through planning up to application--is efficiency. The latter must be viewed not only as economic, but primarily as social efficiency (Ehlemann).

The seminar participants expressed their desire for the continued organization of similarly oriented scientific research presentations.

Automated Control in Production

Prague MECHANIZACE A AUTOMATIZACE ADMINISTRATIVY in Slovak No 7, 1983
pp 250-255

[Article by Eng Dusan Marcek, CSc, General Management, Woodworking and Furniture Industry, Zilina: "Automated Control System of Technological Production Processes in the Woodworking and Furniture Industry Economic Production Unit"]

[Text] The nature of production in a VHJ [economic production unit] whose priority mission is to meet its basic task--direct control of material production while achieving the required technoeconomic criteria--predetermines an important position in developing ASR [automated control systems] into ASR of production. From this it logically follows that the key thematic contents and, at the same time, the priority sphere in the development of ASR ought to be development of ASR in the sphere of production. The heterogeneity of conditions attendant to the production process, the methodology devised for development of ASR, as well as the theoretical, organizational and personnel conditions for its implementation in practical situations account for this not being so.

We shall use the term ASRVTP to denote an "automated system for control of technological processes," including direct technological control of recording of technological parameters as well as operational control, dispatching control and operational recordkeeping on the controlled project. In direct technological control, or in the recording and assessing of technological parameters, most cases will involve automatic or automated control of technological equipment sets and coordination of operations of the sets so as to meet the required technological mode.

The second part of the delineation of the thematic contents of the term ASRVTP, i.e., operation control, dispatching and operational recordkeeping, obviously extends also to elements that fall within the sphere of being dealt with at higher levels of management, accounting for their mutual overlapping, and no precise boundary has even theoretically been delineated between them. With regard to the subsequently described sphere of operational recordkeeping on the control object, we shall primarily have the following in mind:

--monitoring of the production process (recording the volume and quality of finished products, recording outputs and performance, consumption of materials, energy sources and outage times of technological systems), decisionmaking and operational adjustments in cases of deviation from the planned progress as well as the determination of optimum production of individual sets;

--monitoring of technological discipline in connection with maintaining the quality of production, scheduling technological operations in accordance with the state and results of preceding operations;

--monitoring of the state of subsequent (subsidiary) operations that can affect the production process and preparations for optimum distribution of raw and processed materials, semifinished products and energy sources;

--preparation and output of data for a hierarchically higher level (ASRP [Automated System for Management of Enterprises]).

In an overall concept, the control system developed within the ASRVTP can be divided on the basis of the delineation of its thematic contents into two independent sublevels: a lower level of technological control and a higher level of operational/dispatching control of the production process. Characteristic of the lower level is the elimination of the human element from the control process, while at the higher level man remains the controlling subject who, however, has at his disposal in real time all the requisite information for control and, prior to making an actual decision, has the opportunity to evaluate the impact of an alternative decision.

In characterizing the attained state we shall keep in mind the presented facts, which will also form the basic viewpoint for classification of ASRVTP tasks implemented and dealt with in a VHJ.

1. State of ASRVTP--Technological Control Level

The first act of the VHJ in this sphere, going back to the beginning of the Sixth 5-Year Plan, in some furniture production plants (Drevoindustria Zilina, Drevoindustria Pezinok, Mier Hlohovec, Mier Filakovo, ZNZ [West Slovak Furniture Production Plants] Bratislava), was the installation of a control/recording system of the Vilati-Procesograph Company. From the viewpoint of their ultimate utilization the systems are of an exclusively dispatching character, with direct measurement and recording of technological times. The systems are to register and keep a record of some basic states of production facilities within the overall available working time. This involves the assessment of shifts, days, 10-day periods, months and their cumulatives. The attained results were commensurate with the technical capabilities of these systems as well as the state of preparedness of their users.

A certain supplement to systems of the Procesograph-type in some cases was the subsequent installation of a Hungarian-made minicomputer built from PC-4000 elements of the third generation with a limited memory capacity (memory unit with a capacity of 4K of 32-bit words, V/V [input/output] units consisting of a Consul typewriter, DP reader/puncher, a mosaic printer and a disk with 200K word capacity).

The reason for supplementing the control/recording system by a minicomputer was not only to augment dispatching control of the production process (monitoring output at workplaces per shift, day and longer periods of time, monitoring the meeting of the series production plan with indication of deviations and control of intermediate storage of parts), but also to facilitate the processing of records in the area of MTZ [material and technical supply] (record of issue slips for materials according to production

series, storage administration), planned and resultant calculations, wages, etc., i.e., tasks falling within the level of operational control and/or the sphere of ASRP.

The limiting condition, mainly shortcomings of this computation system, such as limited operational memory, makes it impossible to implement the simultaneous handling of multiple tasks. Additional shortcomings of the system, such as its low operational reliability, and complicated servicing, are indicative of the obsolescence of the system. Thus, its users endeavor to double this system or try to replace it by a SMEP-type computer.

A successfully tackled, solved and repeatedly applied task was "Automatic Measurement of Roundwood and Finished Lumber With the Use of SAPI [Systems for Automatic Acquisition of Information]" handled by the VVU DNP [Research and Developmental Institute of the Woodworking and Furniture Industry] in Bratislava. A schematic example of the use of the modular SAPI is shown in Figure 1. The JPR 12 program control unit constitutes the basic unit of the modular SAPI and performs the function of a control computer. The modular SAPI is designed for the automation of individual machines and centers as well as for use in integrated automated control systems.

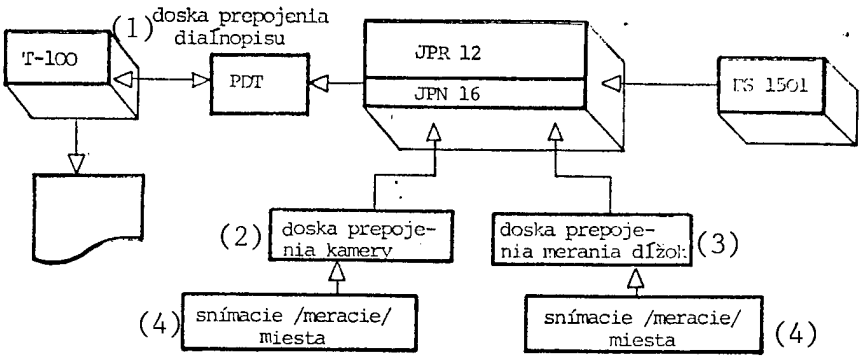

Figure 1. Application of Modular SAPI in Measuring

Key:

(1) Interconnecting plate for teletype
(2) Interconnecting plate for camera
(3) Interconnecting plate for length measurements
(4) Scanning (measuring) points

As part of the mentioned project task came the development of two plates for interconnecting JNP 16 units--a plate for measuring the thickness (diameter) of roundwood by means of a television camera and a plate for interconnecting the length measurements of roundwood. By means of these interconnecting plates it is possible to automate all work centers in woodworking production where there is a need for obtaining dimensions of the diameter (width) and length of roundwood (lumber).

The project is developed further to combine the measuring of roundwood with the cutting of long roundwood and with the sorting of logs. The resultant design has been applied in Drevoindustria Pezinok, and Tatra Furniture Pravenec, and others are projected for Bucina in Zarnovica and Drevoindustria Oravsky Podzamok.

A typical and, at the same time, most extensive project task in ASRTP [Automated Systems for Control of Technological Processes] is the design and comprehensive providing of a control system for suppliers abroad as part of the technical delivery of the construction of a new sawmill: "Systematic Design of ASRTP in Selected Technological Centers of the Newly Built Sawmill of the Bucina Enterprise in Zvolen." The following functions in the sawmill's control system are performed by computer:

--measurement of the length and diameter of logs and their recording;

--optimum sorting of logs to sawing machines;

--programmed preselection of cutting sequences on sets of machinery, monitoring and recording of operational states of sawing machinery;

--sorting and recording of large and small rafters;

--measuring, distribution of logs to stacking fields, printout of recorded entries;

--outputs for linkage into ASRP.

Control of these operations is from the technical viewpoint performed by two computers, whereby the first four functions are performed by the PDP-11/34 computer, the fifth function is performed with the cooperation of the Crossbar system (programmed preselection of lumber sorting) and the PDP-11/03 computer. The sorting program operates in consonance with the state of programmed preselection (Crossbar--programming panel), the computer controls the flow of boards (finished lumber) between collecting boxes. The technical system includes an on-line connection between the PDP-11/03 and PDP-11/34 computers, as well as an interface for scanning systems of technological processes by means of special modules. A schematic outline of the sawmill's computer control system is provided in Figure 2.

[Figure 2, next page]

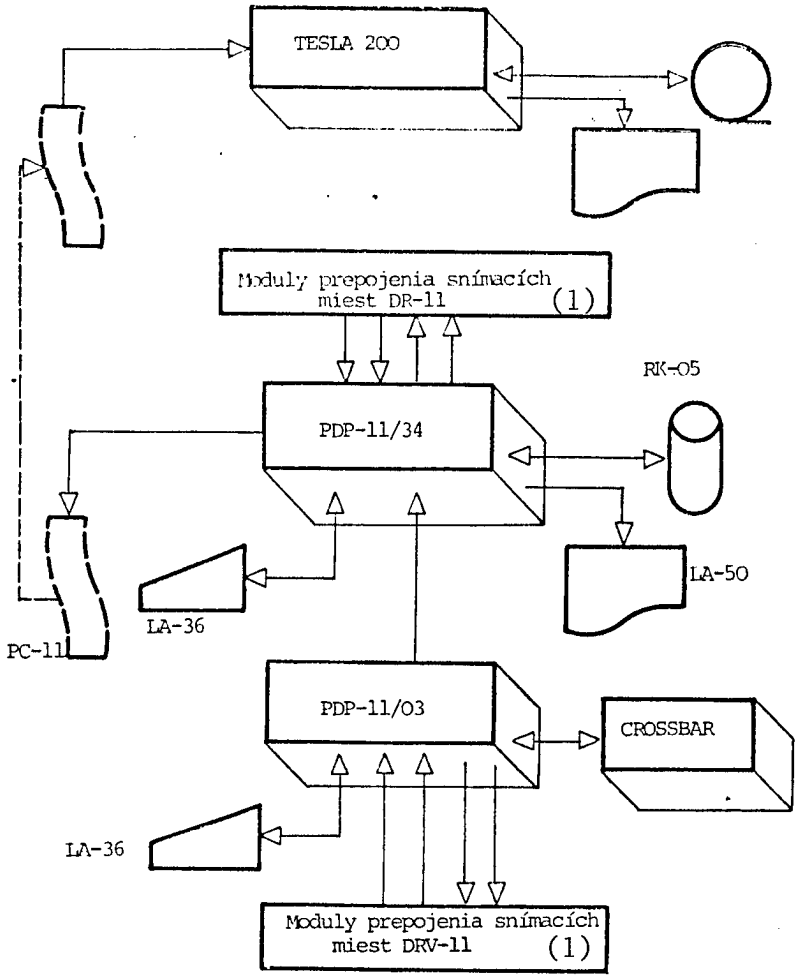

Figure 2. ASRTP control system of the sawmill in Bucina Enterprise Zvolen

Key:

(1) Modules for interconnecting scanning points

Linkage to a hierarchically higher automated control system within ASRTP uses perforated tape on which are recorded--in addition to identification data (plant, center, date, shift)--data regarding daily production according to work stations (machines), products, calculation units and the produced volume. The TESLA 200 computer is used to process daily, monthly and annual outputs in relation to meeting the production plan and any deviations therefrom, specifying in detail the assortment with the requisite totals per machine, shift, day with recapitulation per intraplant unit and per plant. Combination of total daily production with the main set keeping track of products and raw materials makes it possible to calculate and provide a printout of value indicators relevant to the sawmill's production.

The technological control system, as has already been mentioned, was provided by a supplier from abroad as part of a technological delivery. The

superstructure--interconnection of technological control with production control by means of an operational plan--was devised by the external domestic organization USIP [Institute of Industrial Systemic Engineering] in Zvolen as part of dealing with ASRP tasks which, for all practical purposes and in the true meaning of the word, translates into the solution of ASRVTP. The key reason for this interconnection and/or for use of the TESLA 200 computer was based on the formation of a comprehensive data base for ASRP and, thus, the adaptation and adjustment of linkages to other subsystems dealt with within ASRP (logistics, marketing, manpower, accounting and financing). Due to wear and tear and the obsolescence of the TESLA 200 computer system, it is envisioned to reprogram the superstructure of the technological control system into the RPP-16 or PDP-11/34 computer. Along with reprogramming the superstructure, consideration is being given to upgrading the system so that it would monitor basic consumption as well as recordkeeping of the output and material consumption of the entire sawmill in real time.

As part of the state project "Control of Wood Drying Facilities by Microcomputer" the URAP [expansion unknown] in Zilina developed a system for control of wood drying facilities by the SM-50/40 microcomputer that was verified in the Tatra Furniture Enterprise in Pravenec. Developed as part of the project was an operator's control panel, an environmental monitoring unit, computer (program) control of the control system. The operator's panel makes it possible to control eight drying boxes simultaneously in the form of instructions from the operator. The operator's functions are limited to input of data for phases of the drying process, start-up (restarting) and stopping of the process, dealing with emergency situations and monitoring the drying process. The functions left to the computer are computation of constants, the desired controlled and controlling magnitudes of the drying process and providing an optimal technological process for wood drying. The project envisions the innovation of drying facilities in the VHJ and the application of microcomputer control to drying kilns by their producer, Vzduchotechnika in Nove Mesto on the Vah River.

The project "ASRVTP in the Drevoindustria Enterprise in Liptovsky Hradok" is at the technoeconomical study stage. The objective of the study is microcomputer control of technological work centers with linkage to a hierarchically higher SMEP-type computer. The goal is to devise and implement a production control system for standard modes of operation and for control of deviations. In view of the unresolved investment situation relevant to the technical control system, we shall not deal with that project in detail.

The last project we plan to describe in this part is of a special nature and cannot be unequivocally classified as belonging to one of the two mentioned ASRVTP groups. It seems to us that in this case the control involves optimization implemented by means of a technological system and, as such, we shall deal briefly with it at this point. In 1980 the project entitled "Optimization of Structural Boards Cutting," handled by USIP Zvolen, was concluded. It was based on the requirement of controlling technological processes involving bulk materials and providing for maximum yield, as well as achieving full capacity utilization of formatting facilities.

A simplex method was used for optimization in dealing with the project. The original intent envisioned the use of only one formatting system; the problem was soon generalized to take into account all formatting systems in the VHJ, where the computation center of the Bucina enterprise in Zvolen provides computer services in this area to other VHJ enterprises by means of the RPP-16 computer.

2. State of ASRVTP--Operational (Dispatching) Control Level

We deem it necessary to point out at the very start that the individual hierarchical control levels in the woodworking and furniture industry are not at a mutually commensurate level from the viewpoint of automation. From the preceding section it follows that suitable objects for direct computer control of technological processes are those found in primary woodworking production. The key effect of computer control of direct technological processes in primary woodworking production is reflected in an increased yield of lumber, in stabilizing all important factors of technological processes (temperature, humidity, time, pressure, etc.) at their optimum values, a fact that ultimately is reflected in improving and stabilizing the quality of products. In final production (furniture and prefabricated structures) the focal point of a computer system's operation in operational-dispatching control will consist in providing recordkeeping and production control that may provide direct contributions to improved utilization of available working time, better use of technological equipment, raw materials and energy sources, not only in plants producing furniture, but also in plants and enterprises of a combine character where it is possible to provide for, e.g., optimization of milling for a specific use in final production.

Furniture production resembles machine building in its nature and complexity. The extent and character of production data, complicated control and complex recordkeeping make dealing with its problems both topical and important.

A no less important requirement that has been increasingly coming to the foreground lately is the demand for control of production processes in real time. This area of design has been quite well described in many publications, but accounts of original experience have not been published as often. In view of the fact that this sphere--in cooperation with the VHJ--is currently nearing the implementation stage, without trying to anticipate events, we consider it expedient to describe the attained state of dealing with these problems in the VHJ and thus contribute to spanning the cited gap in published literature.

Under VHJ conditions the DNP [woodworking and furniture industry] Institute in Bratislava is currently using the modular SAPI and a computer of the SMEP series to deal with the project "Automated System for Dispatcher Control of Production Processes." The project deals with a system for controlling production in a type of enterprise using a production program for furniture designed for sitting. The system for controlling the production of such furniture is based on a typical organization of the production process based on operational control as well as control of storage and intermediate storage.

This involves the automated processing of records relevant to the supply of materials and parts, the issue and movement of stored supplies, and controlling issue from storage in linkage to the operational plan. In the given case--involving the type of organization of production and the attendant record-keeping by means of a system for management of large-capacity storage facilities, where supplies are stored by means of shelf-stowing equipment with automatic or semiautomatic control--it is envisioned to use automated records processing as well as control of performed production operations, control and placement of pallets containing parts in storage cells, an operational plan for storage issues, keeping of records and inventories of the state of supplies in storage.

The main dispatching center at a higher level is connected to control of storage facilities with linkage to the movement of parts in the production process and processing of data covering a month or longer periods.

The hardware of the computer system for this level of control of storage (intermediate storage) facilities is based on the demands made on this system in order to provide for management and control of storage facilities with linkage to operational planning of production; its schematic representation is shown in Figure 3. In this case the terminals for recording production turned over for storage are formed by identification sensors and numerical keyboards. From the level of control of the main dispatching center (superior level) are coordinated lower centers with monitoring of the movement of parts and processing of data for monthly planning and accounting periods from perforated tapes. The operational plan of lower centers is envisioned to be processed at the level of control from the main dispatching center and at the level of plant management. Interlinkage between lower and higher control levels uses manual operation by means of perforated tape.

In case of outage of computer control of storage facilities (JPR 12), daily information about the movement of pallets in intermediate storage is recorded manually and, at the higher control level, by the SM-3/20 computer, where there is compiled information about the current state of storage management in the form of tabular summaries as well as information recorded on perforated tape which soon (after restored storage control by computer) is used for input of the current specific state of storage. In case of outage of the SM-3/20 computer, control is taken over by the JPR 12 computer (reserve system).

The project "Control System for Production of Furniture Designed for Sitting" is dealt with on behalf of the furniture plant of the Bukoza enterprise in Vranov on the Topla River, with potential application in other VHJ enterprises. Implementation of the project is currently nearing completion and the system is subsequently scheduled to be turned over for routine operation.

[Figure 3, next page]

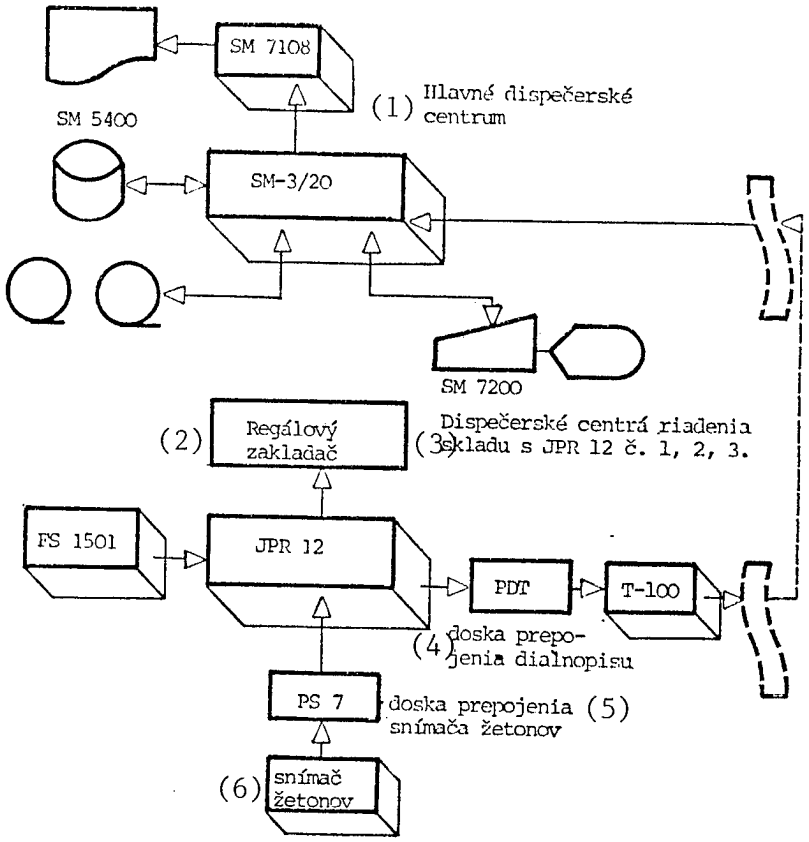

Figure 3. Control system for a plant producing furniture designed for sitting

Key:

(1) Main dispatching center
(2) Shelf-stowing equipment
(3) Dispatching centers for storage control with JPR 12, no 1, 2, 3
(4) Interconnecting plate for teletype
(5) Interconnecting plate for identification scanner
(6) Identification scanner

An analogous project for dispatcher control of furniture production is the project for primary woodworking production, "Organization and Control of Production in the New Veneering Plant in Zarnovica," undertaken by EKORG [expansion unknown] in Zilina. It essentially represents a superstructure of the project "Automated Measurement of Roundwood with the Use of SAPI" in the area of operational planning and dispatch control of a plant producing veneers. The control system is to provide for monitoring of the meeting and specification of production quotas, monitoring and control of the state of the production facilities.

In this concept, specification of production tasks is based on monthly schedules of tasks with computer-aided breakdown of materials, breakdown of instructions for issue from storage, capacity (machinery) assignment

as well as determination of the beginning of the production cycle and progress of the production of batches specified to 10-day periods and a breakdown of production instruction for individual work stations. Controlling the state of selected production and technological centers includes monitoring of operational storage (received and issued items), outages of key machines and equipment with the use of outputs from the project "Automated Measurement of Roundwood and Lumber with the Use of SAPI" to obtain by means of perforated tape data regarding technological centers. It is envisioned to perform reporting of information regarding receipts and issue of materials from operational storage and reporting machinery malfunctions by means of remote terminals. This project is at the present time one step away from the implementational stage.

As was the case in the preceding section, the next project is of a special nature which also cannot be classified into one of the two mentioned ASRVTP levels; on the basis of the recommended structuring of ASRP, ASRSC [expansion unknown], and VHJ ASR, one cannot even unequivocally determine its predominant nature. We are of the opinion that the project presented below in its ultimate impact and also in its immediate goal relates to improving the efficiency of devising as well as of the variable assessment of production technology for new products and for meeting the needs of the populace in the form of improving the quality of marketing services; we are thus justified in including it in this chapter. The project involved is "Research on the Application of Computer Technology in the Design and Preparation of Production in Furniture and Interior Household Furnishings Manufacture," prepared by the VVU DNP in Bratislava and consisting of three partial projects.

The subject and scope of the first partial project is the utilization of computer technology in proposing alternate products by means of an interactive graphic system. The solution envisions the application of the basic set of the SM-4/20 computer (large capacity disk) with a peripheral graphic terminal, including a light pen, a coordinate recorder (BAK 57) and a graphic drawing system (BGF 1712). This is based on the assumption that interactive communication between designer and computer with the use of a picture screen terminal and a light pen will make interior design as well as furniture manufacture more efficient.

The design logic is based on automated meeting of the designer's initial requirements where the computer, on the basis of specified linkages and a data bank of furniture elements and a catalogue of parts, makes a search for the required part (set) of furniture.

In the second partial project the set of programs of the first partial project is expanded by subprograms (programs) which will carry out alternative assessment of proposed designs. It is envisioned to generate herein technological production sequences for production and to assess the effectiveness of the design on the basis of planned costs derived from variable calculation data.

The third part of the partial project involves the optimization of the distribution and production of household furnishings. In addition, thought

is also being given to the use of a computer for the assessment of the daily operation and administration of the retail outlet.

Thus, the solution of the project "Research on the Application of Computer Technology in the Design and Preparation of Production in Furniture and Interior Household Furnishings Manufacture" calls in mutual interlinkage for testing and putting to use very complex, user-oriented software through the generation of an algorithmic base--a set of algorithmic modules (subprograms) and generation of a data base including a catalogue of data regarding standardized furniture elements. The objects for the project's application are assumed to be retail outlets marketing furniture and the Drevona commercial enterprise in Zilina. The first two partial projects are planned to be completed in 1984, the third partial project should be implemented in the first or second quarter of 1985.

Another project which was dealt with simultaneously with the project "Optimization of Pressed Boards" with the objective of using the RPP-16 computer was one for operational recoding of production and recording of the storage of products in wood-fiber board and surface finishing workshops of the Bucina enterprise in Zvolen. The project's goal was to provide operational information on control of production, handling of semifinished and finished products, automated processing of daily and cumulative production outputs, computer processing of consumption records as well as shipping of products as against the plan quotas and economic contracts.

The proposed delineated scope encompasses the transmission of data directly from the work station with linkage to bookkeeping records and statistical accounting in real time. Transmission of data for operational monitoring of outputs is provided, from the technical viewpoint, by on-line connection of T-100 teletypes with the RPP-16 computer. Transmission of data via teletype occurs directly from the workshop planner from documentation regarding turned over production and from pressing records.

Processing of operational documentation regarding movement of semifinished and finished products in wood-fiber board and surface finishing workshops and storage management is technically provided by uninterrupted (continuous) transmission of data from issue slips, from records regarding the consumption of semifinished products and interplant transfer of semifinished products during work shifts via the T-100 teletype terminal into the RPP-16 computer. This provides for comprehensive keeping of storage records, storage accounting and ongoing continuous assessment of meeting marketing arrangements and economic contracts with the customer, but also for the assessment of meeting planned cooperation. The computer at the same time compiles and keeps records of outputs for remuneration of storage personnel. The project is in routine use and its implementation is to be expanded to the dimensional cutting shop and the parquetry shop economic units. As part of the project it is envisioned to work out the solution up to the level of computerized processing of the V 1-12 accounting report.

In all the documented projects we have attempted to point out the connection between mutual supplementing in full formulation by ASRTP, ASRVTP and ASRP under the given VHJ conditions. As in other production sectors, within the VHJ there is a need to respect specific conditions and requirements of individual users while maintaining a uniform concept of the automated control system. Such an approach facilitates the gradual application and expansion of ASRVTP while cutting down on the time for preparation of programs while maintaining the organizational structure of and organization of control by production units.

3. Outlook and Conclusions

The typical processes that lend themselves to automation by means of computer technology in VHJ's are primarily technological and production processes in the cutting of roundwood. These processes are most well and reliably developed, in relation to automation, among advanced woodworking enterprises and/or producers of the relevant technological equipment. This involves primarily the following technological centers in the processing of roundwood:

--measuring and cutting of roundwood;

--sorting of logs;

--measuring and sorting of finished lumber;

--stacking and palletization of finished lumber.

A hierarchically higher control system, superior to all local control systems, is often set up for the purpose of coordinating the operations of the mentioned technological centers and for attaining the overall production-economic goals.

Continuing automation of production leads to the continuous implementation of new control systems production centers that show considerable affinity. In a delineated autonomous sector (e.g., operations of the new sawmill in the Bucina enterprise in Zvolen or the Zarnovica enterprise), production is controlled by coordinating operational control (ASRP) with preliminary analysis and optimization on individual production assemblies (ASRTP).

Other potential objects for automation are technological processes in drying of wood (finished lumber), production of wood-fiber and groundwood boards, some machinery and equipment used in furniture production, and also all other production processes in larger enterprises engaged in primary production and furniture manufacture. In all of these processes it is possible to use SMEP I and SMEP II computer technology for automation purposes. A favorable factor is also the fact that there is a certain degree of software and hardware compatibility between some computers of the SMEP series and foreign computers used in the VHJ (PDO-11/34 and SM-4/20, PDP-11/03 and SM-13/20) which can be used for more efficient progress in planning and design.

As already stated, planning and design of ASRVTP in the VHJ is carried out primarily by two research institutes (VVU DNP Bratislava and EKORG Zilina), and its implementation, from the chronological viewpoint, is carried out in two ways.

The first way was characteristic of the initial phase of ASRVTP implementation where, in comparison with the contemporary state of affairs, hardware and software means for control of technological processes were limited. For that reason a decision was made in 1976 to import ASRTP with complete software and hardware as part of the technological equipment (ASRTP in the newly built sawmill of the Bucina enterprise in Zvolen) with the participation of the domestic planning and design organization (USIP Zvolen) in the area of coordination, systemic design, providing specialized assistance for users, etc.

The second way, historically of more recent origin, of implementing ASRVTP was planning and design by our domestic organizations as part of the technological project within the restructuring of production capacities, and as upgrading the efficiency of the existing control system with the use of both domestic and foreign technical means.

Despite rapidly progressing implementation warranting both reliability and effectiveness, because of the demand on foreign exchange resources this way must be regarded as impossible in the future in the context of the approved Program of Economization in the Seventh 5-Year Plan (a program adopted by the government in late 1981). The vast majority of implemented ASRVTP will have to be designed and built by our own (domestic) capacities. In addition to saving foreign exchange resources, this approach facilitates in its way multiple application and its own continued development.

The correctness of the capability of planning and design capacities in their orientation toward the implementation of ASRVTP will be verified by its implementational phases. In further progress there will arise the need, first of all, to analyze the situation in the VHJ's most suitable plants and enterprises from the viewpoint of computer technology applications. It will be desirable to orient this analysis mainly toward production-technology conditions, discipline in conventional methods of management, requisite qualifications of key personnel and/or of the general management, etc. After such research and some eventual changes have been accomplished it will be possible to select the most suitable installations for the application of computer technology, determine the obligatory procedures and adopt decisive measures for enforcing adherence.

Respecting the requirements for the application of ASRVTP projects under operational conditions calls for adapting projects to the given and invariable operational conditions of technological installations. Research on the current state of technological installations and individual areas in dealing with ASRVTP as well as the gained experience show that technological centers for handling of roundwood and finished lumber show equal operational properties and, consequently, lend themselves to direct the application of ASRTP projects. The situation is different in the case of technological

assemblies which externally perform the same function but, as a rule, possess different operational properties, making it impossible simply to apply "type" software. Such repeated applications call for participation by designers, combined with improved efficiency of the original concept, which in many cases translates into a qualitatively new, improved concept.

With an eye to the future, new potential applications for electronics will be created in the VHJ. Preparations are underway in the VHJ to embark on machine building within which it would be possible to produce certain technological equipment for the woodworking industry and, consequently, reduce dependence on importation of automation technology, primarily from nonsocialist countries. Realization of these intentions would make it possible to equip the produced systems with electronic equipment to at least the same extent as is currently encountered in imported systems, whereby technological units imported and used by the VHJ could serve as models. At present, or in the near future, there will also be created a certain amount of room for the application of electronics, offering the possibility of producing replacement parts or functional replacement modules for electronic devices imported as part of a technological system from nonsocialist countries.

In conclusion, we would like to point out that we did not deal in this article with all aspects of ASRVTP design. In this respect we have in mind primarily those projects which in their initial stages of design had to be dropped because of uncertain availability of investments for new or redeveloped construction projects.

It can be stated that our own research and experience has laid the foundation for continued development of ASRVTP. The fact that we have caught on to the emergence of microcomputer technology and computer graphics, although somewhat belatedly, can be viewed favorably. Microcomputer technology produced with the use of domestic spare parts, or spare parts from CEMA countries, must become an integral part of ASRVTP design wherever its utilization is suitable and it is possible to use for the innovation of already implemented projects.

Development in the area of dealing with ASR problems is progressing at a fast rate. However, correctness of orientation and estimation of the direction of continued development in this area is no easy matter. We are of the opinion that, in addition to the already mentioned typical areas of ASRVTP, application in the Woodworking and Furniture Industry VHJ with effective support provided by electronic elements is but one aspect of the matter. In respecting the effectiveness of the applied design solution, an indisputably important factor is also providing for interlinkage of various levels of control in order to create a comprehensive and integrated vertical system of management. It stands to reason that the implementation of this requirement will encounter many problems, the effective solution of which--if not handled by an independent group of problem solvers--will place considerable demands on coordination in the implementation of ASR in the VHJ.

As a necessary prerequisite to more resolute advances in ASRVTP it is imperative to create the requisite conditions from continuous production, as well as for the organization and utilization of design, planning and implementation efforts.

BIBLIOGRAPHY

1. "Automated System for Control of Technological Production Processes (ASRVTP) in Production of Coniferous Lumber in the Drevoindustria Plant Liptovsky Hradok," EKORG Zilina, June 1981.

2. Bosak, B., "Program for Economization in the Seventh 5-Year Plan," HOSPODARSKE NOVINY, March 1982.

3. Jankovsky, J., "Applications of SAPI in the Woodworking and Furniture Industry." Monograph from the symposium "Utilization of Computers in Forestry and Woodworking Research and Field Work," UAKaVT Zvolen, September 1979.

4. "A Concept of ASR VHJ Implementation Until 1990," DNP Zilina general management, May 1979.

5. "Control Systems in Furniture Manufacture," VVU DNP Bratislava, May 1980.

6. "Systemic ASRTP Design in Selected Technological Centers of a Newly Built Sawmill," USIP Zvolen, July 1980.

7. "Research on the Application of Computer Technology in the Design and Preparation of Production in Furniture and Interior Household Furnishings Manufacture," VVU DNP Bratislava, November 1979.

Tesla Computer Semiconductor Memory

Prague MECHANIZACE A AUTOMATIZACE ADMINISTRATIVY in Slovak No 10, 1983 pp 389-393

[Article by Eng Stefan Toth, Tesla Concern Enterprise in Piestany, and Eng Stanislaw Broz: "Operational Semiconductor Memory in Tesla 270/300 Computers"]

[Excerpts] Introductory Note

Tesla computers come with an operational ferrite memory of 64 kB or 128 kB as standard equipment. Tesla Pardubice offers for installed computers a set for expansion of memory from 64 kB to 128 kB, and for external memory block extension from 128 kB to 256 kB. The supplied ferrite memories are relatively very reliable; nevertheless, there sometimes occur serious breakdowns (e.g., interruption of selection guide in the ferrite core matrix) that are difficult to eliminate. The considerable complexity of ferrite memories affects their price, which ranges around Kcs 350,000 for expansion to 128 kB and Kcs 1,314,000 for procurement of an external memory block. The relatively considerable demand of ferritic memories on energy also cannot

be disregarded. It can be assumed that it is specifically the high price of an external memory block that constitutes an obstacle to wider use of 256 kB memories by many users of Tesla computers.

The development of production of integrated semiconductor circuits offers the possibility of expanding a Tesla computer ferrite memory by semiconductor memory blocks, and of fully replacing a ferrite memory by a semiconductor version of 256 kB capacity. The following demands are made on semiconductor memory for a Tesla computer:

--the entire memory must be made up of domestically available parts from Tesla catalogues;

--the semiconductor memory must be capable of operating independently with a capacity of 64 kB, 128 kB or 256 kB as well as of expanding a ferrite memory from 64 kB to 128 kB or 256 kB and a 128 kB ferrite memory to 256 kB;

--the semiconductor memory must be built directly into the central unit of the computer as an independent closed unit connected to computer circuits; such a concept makes it possible later to install the entire memory into a small external frame and connect it after adaptation to the connector of the existing ferrite memory;

--no modifications must be made on the computer circuits during installation of the semiconductor memory; the memory must be connected to circuits prepared for an external ferrite memory.

All of the specified conditions are met by the semiconductor memory developed in the computer center of the Vagonka [RR rolling stock production] in Studenka in cooperation with Tesla Piestany. The memory was installed into Tesla computer serial production number K 100 in Studenka. The basic memory element is an integrated unipolar dynamic memory circuit MHB 4116 with a 16 k x 1 bit arrangement produced by Tesla Piestany.

Dynamic Memory RAM MHB 4116

The advantage offered by dynamic memories--a small geometrical dimension of the memory cell--compensates for its disadvantage--the need for time-controlled restoration of information in large-capacity circuits. The current new generation of RAM memories includes types with a capacity of 4 kbit and more. The key common feature of these memories is the address strobing technique based on the fact that in the production of memory systems of a higher capacity for installation into printed circuits it is better, from the viewpoint of economy, to use memory circuits encased in a casing with a smaller number of lead-ins, even at the cost of a certain complexity of peripheral circuits.

The MHB 4116 circuit is a dynamic RAM memory with a capacity of 16384 x 1 bit produced by NMOS technology with a double layer of polycrystalline silicon. It operates with four feed voltages, U_{CC} = + 5 V, U_{SS} = 0V, U_{BB} = 5 V, U_{DD} = - 12 V, making it compatible with TTL circuits. It is encased in a DIL casing with 16 lead-ins.

The memory cell is single transistor with memory capacity and is divided into two symmetrical parts with 64 lines and 128 columns. The reading column amplifiers are also symmetrical and operate into an independent busbar input/output for both parts of the memory matrix.

Technical treatment of a false report IP.R.AM, developed for LAI instruction in Tesla Pardubice, consists in the modification of four addresses of dead memory and affects the functioning of memory protection; we do not recommend its use. Consideration must also be given to the fact that some standard programs will fail to operate in the F2 process, such as repetition points, printout of memory after failure, etc.

Even though we can change the capacity of memory during the computer's operation by means of a few push-buttons, program restriction in routine operation was found suitable and if the mentioned principles are adhered to, no problems are encountered in using the 256 kb memory. Experience with the utilization of 256 kb memories in Tesla computers could also be published by 256 kb ferrite memory users, because from the user viewpoint there is no difference between a semiconductor and a ferrite memory.

Conclusion

The installation of a semiconductor memory into Tesla computers showed the favorable properties of dynamic integrated MHB 4116 memories from Tesla Piestany even in use as operational memory of larger computers. The laboriousness of semiconductor memory production is incomparably smaller compared to ferrite memories. The costs for a complete semiconductor memory of 256 kB do not exceed Kcs 150,000 to 200,000. The memory can be repaired very easily, and the pinpointing of a defective integrated circuit takes only a few minutes. Since the memory uses only four types of plates, keeping a spare for each presents no problem in any computer center.

In our opinion, technicians of computer centers will face no problem once plates for semiconductor memory are in serial production, and no problem should be encountered in providing cabling for memory in the computer, which would expand the utilizability of computers of the Tesla series at low cost.

GDR Robotron Office Computers

Prague MECHANIZACE A AUTOMATIZACE ADMINISTRATIVY in Slovak No 11, 1983 pp 442-443

[Text] New Products from Robotron

Computer technology in general and office computers in particular that bear the mark of Robotron from the GDR enjoy a very good reputation in the CSSR and have been in use for many years in many enterprises and institutions. Czechoslovak specialists and other interested parties were provided in late May an opportunity to familiarize themselves with Robotron's latest export offer in Prague. The exposition hall of the Office Machinery enterprise

on Rytirska Street exhibited not only instrumentation, but for 4 days it also offered specialized lectures. The topics included the EC 1055 and EC 1055M computer system, the A 6402 commercial-type computer, the A 5120/5130 office computers with terminals as well as the K 1520 microcomputer system. The instruments being discussed, except the EC 1055 and EC 1055M systems, formed part of the exposition.

Extraordinary interest among visitors was generated by the Robotron A 6420 computer system which had not been supplied to Czechoslovakia previously. It can be used for scientific, technical and economic computations, as a terminal control computer, as an image processing system or for control of technological processes. Of interest among other exhibited products were Robotron A 5120 (portable) and 5130 (built into a special stand) office computers. These involve a general purpose modular system that can find application in data acquisition, bookkeeping, billing and accounting, or in mass data processing in all sectors of the national economy.

Visitors' interest was also stirred by a new product--the Robotron 1157 mosaic printer with an output of 180 characters per second which is to be supplied to Czechoslovakia as early as the current year. Robotron representatives also presented in Prague their new developmental product in the sphere of computer technology--the Robotron K 1520 microcomputer. Personnel engaged in administration were primarily interested in electronic typewriters at the exposition, for example, the S 6011 type with a wide array of functions.

The organization of the exposition and invitations to lecturers were provided by the public relations agency CTK - Made in... (Publicity), which has been cooperating with the Robotron combine promotion in Czechoslovakia for many years.

Computer Technology Achievements, Outlook

Prague MECHANIZACE A AUTOMATIZACE ADMINISTRATIVY in Slovak No 12, 1983
pp 453-454

[Article by Eng Stanislav Novak: "Results and Outlooks in Computer Technology"]

[Text] The periodical RECHENTECHNIK UND DATENVERARBEITUNG published an article by the director of the Coordination Center of the Intergovernmental Committee for Computer Technology, M. E. Rakovsky, about results and outlooks in computer technology. The article includes an assessment of the extant development of computer technology in the socialist countries, points out the key problems of future development and indicates approaches to their solution. In view of the significance of these problems to our orientation in the continued development of computer technology, we offer to our readers a summary of the article, outlining its key ideas.

Now is an opportune time to assess the results and outlooks of the 12-year old cooperation of socialist countries in the joint development and production of computers and to draw some conclusions. The production of computer technology underwent a 3.5-fold increase in 15 years, and the mutual exchange of products a more than fivefold increase. This bears witness to the considerable success achieved in mutual cooperation. All socialist countries are interested in expanding cooperation, and this expansion is planned in accordance with the agreement of June 1980.

Thanks to the systematic development of computer technology systems, the socialist countries attained significant successes from the viewpoint of the key technical properties of instrumentation and systems. The data listed in Table 1 show that the cost of computer technology, in terms of 1 million operations per second, decreased more than twenty-fold over the past decade (1970-1980). In the subsequent decade, from 1980 to 1990, an additional five-fold decrease in costs can be expected. Nevertheless, it must be pointed out that we still do not use the inventory of computers available in our countries to its full extent.

Table 1. Costs for 1 Million Operations per Second

Year	Computer	Cost in Rubles	Cost per 1 mil. op./s
1970	Minsk 22	10^5	$4 \cdot 10^7$
1975	EC 1040	$1.3 \cdot 10^6$	$5 \cdot 10^6$
1980	EC 1045	$5 \cdot 10^5$	$1{,}5 \cdot 10^6$
1985	EC 1065	$1{,}2 \cdot 10^6$	$6 \cdot 10^5$
1990	EC 1087	$1{,}5 \cdot 10^6$	$3 \cdot 10^5$

Note: costs for computers include the cost of the processor and main memory, costs for 1 million operations per second include costs of the entire computer system related to 1 million operations per second.

The planned generation of computer inventories must be connected with the technological reorientation of the industry. Also deserving of respect is the great number of various users, who differ in their demands on computer technology. The Intergovernmental Committee for Computer Technology is faced with the task of finding an acceptable approach to continued progress in the development, production and effective utilization of microprocessor and computer technology. In order to determine the continued development of cooperation correctly, it is necessary to envision what costs will be incurred in connection with computer technology till the year 2000 and what the attained relevant economic and social results will be. Demands are currently made on the following:

--high productivity of labor in all spheres of human activity;

--substantial improvements in the effectiveness of fixed assets in the entire national economy;

--improvements in working conditions for man by freeing him from heavy work and monotonous operations by transferring them to automated machine tools and robots.

These are the specific viewpoints that must form the basis for dealing with problems that will be facing us in the next 20 years.

We have already acquired significant experience in the development and application of computer technology. Socialist countries are now faced with the task of adopting a decision regarding continued specialization and finding optimum approaches to expanding cooperation. Now, as before, there is a need to adhere herein to the principles of mutual balance of national and international interests of all countries participating in agreements. Here we are obliged to respect production costs and compare them with envisioned economic results. High quality and low cost of computer technology is the only way to attain success.

For determining the requisite increases of productivity in computer technology it is very important to know the volume of information that is currently being processed in our countries and its further development. If we assume that each person engaged in the national economy requires an average volume of information on the order of 2.10^5 bytes per year, with approximately 250 million working people in our countries, the annual volume of processed information is 10^{14} bytes. Here it ought to be pointed out that a computer inventory operating at a speed of 10^9 pieces of information per second processes 1.3×10^{16} operations per year. Increments in the volume of processed information depend on:

--annual increment in national product;

--annual increment in investment capital;

--population increases.

Analyses show that the volume of information will keep increasing in our countries over the next 20 years, probably as follows:

--ten-fold at 12 percent of annual increment;

--fifteen-fold at 15 percent of annual increment.

It is important to know not only the volume of information that must be processed, but also the relevant user areas. The structural arrangement of information that must be processed for the management of the national economy at individual levels can be shown diagrammatically in the form of a hierarchical pyramid.

At the highest level are top organs of state administration. This level has at its disposal the highest capacity computer systems for planning calculations and for national statistics. The volume of information processed at this level amounts to approximately 3 percent of the total

volume of information. At the second level are ministries and other central authorities. These deal with problems of internal and external relations which lead to optimum utilization of the investment capital entrusted to them and to attainment of the desirable economic results. Here approximately 7 percent of the total volume of information is processed. The third level includes bureaus, scientific production associations and associations of enterprises which direct industrial sectors, and is of great importance to the national economy. The key function of this level is the optimization of the production process, providing conditions conducive to meeting plans of enterprises and control of a correct rhythm of operations.

Experience shows that it is specifically the second and third levels that deal with the most complex problems. These also have at their disposal the most extensive data banks. The volume of information processed at these levels amounts to 15 percent of the total volume of information.

At the fourth, i.e., lowest level of the hierarchy are independent economic units. This level processes 75 percent of all information in the national economy. In addition to the large volume of information, this level is characterized by the great diversity of the tasks dealt with, methods used, requirements on programs and on computer technology itself.

The tasks dealt with at this level are very diverse from the viewpoint of their complexity. Nevertheless, they can be divided into individual groups, and for each group it is possible to use common user programs and other computer technology equipment. The potential offered by micro- and mini-computers, which is improving from year to year, can without a doubt find application at this level. Computers of the first, second and third generation could not find application everywhere because of their high price and large dimensions. Mass users, the bottom part of the pyramid (the production sphere, agriculture, health care, design bureaus and small laboratories) need simple, inexpensive, reliable and dimensionally small mini- and micro-computers.

The generation of computer technology systems for the fourth, lowest level calls for a great extent of operations and a well thought out approach agreed upon by all the participating countries. Of importance to a mass user at the present time is the adoption of a uniform unified solution. Such a solution is economically correct, because this approach can cut the cost of systemic documentation. Computer technology systems currently being developed for the fourth level are characterized by their functional orientation and also by their certain degree of general applicability. Such requirements can be met, in our opinion, by programmable multifunctional terminals consisting of five to eight individual units, as shown in Table 2.

These terminals perform various functions such as, e.g., subscriber points, data preparation systems, automated programming units, automated design units, etc. It is turning out that the current 267 varying types of input and output systems, systems for remote data processing and systems for data preparation can, from the viewpoint of functional properties, be replaced by 50-60 types of multifunctional terminals.

Table 2. Basic Units of a Multifunctional Terminal

1. Display	EC 7971	USSR	R	4,000 - 5,000
	CM 7219	Hungary		5,000 - 6,000
2. Contactless keyboard	EC 0101	CSSR		500 - 800
	EC 0101	Hungary		500 - 800
3. Microcomputer	60	USSR		7,000
	50/40-2	GDR		20,000
4. Memory with elastic disk	CM 5605	Hungary		1,500 - 2,000
5. Drum-type graphic system				4,000 - 5,000
6. Alphanumeric printer	EC 7186	Hungary		4,500 - 5,500
	EC 7183	GDR		4,500 - 5,500
7. Modem 200 Bd	EC 8001	Hungary		2,000

The advantages are the following: simple operation, low cost, unlimited potential for the system's expansion. Simplicity of operation of these systems, standard interface for peripheral units and the possibility of adapting both software and hardware for dealing with the most varied tasks make it possible to meet the requirements of a great number of users. Key designers already foresee today the potential for making simple changes in the architecture and logic of mini- and microcomputers by exchanging a single module. This considerably expands the potential for application offered by multifunctional terminals.

The success of problem-oriented small computers is determined by the qualifications of their users. The success of programmable terminals depends on their unification. However, unification efforts are obviously unsatisfactory. Many systems with differing peripheral interface and varying systems documentation are being developed in parallel fashion.

The great demands made on computer technology at the lowest level of the pyramid of users call for concentrated efforts in providing a simple solution for all terminals. On a longer-term basis it is possible to devise user systems in accordance with user requirements through using of national servicing organizations' own resources. Complementary equipment and structural assemblies can be obtained from partner countries. Such systems are simple and inexpensive, but also flexible and compatible in devising computer networks.

It can be expected that the key component of such systems will be a microprocessor with main memory of sufficient capacity located in a common housing with the display unit. Such a microprocessor will be equipped with peripheral memories, such as flexible disk memories, linear and parallel printers and portable devices for connection to a computer network.

Great attention will have to be paid to unification. In the long run we must endeavor to assemble in our countries terminals with varying functions from standardized structural units. Unification of individual elements and of user program packets will make it possible to devise from these unified components flexible and simple systems for handling the most varied national economic tasks at minimum cost.

Projects carried out by the Intergovernmental Committee for Computer Technology are oriented toward uniformity of the developed computer hardware and software. They are to provide for simple, reliable and economically effective operation of the inventory of computers in socialist countries and require from us that we first of all develop multifunctional terminals which will provide for better utilization of the available inventory of computers.

Acoustic Surface Wave Applications

Prague SLABOPROUDY OBZOR in Slovak No 12, 1983 pp 569-575

[Article by Docent Eng Miloslav Nevesely, CSc, Chair of Theoretical Electrotechnical Engineering and Electric Machinery, College of Transportation and Communications, Zilina: "Acoustoelectronic Elements With Acoustic Surface Waves"]

[Text] This article describes the basic properties of elements and systems with acoustic surface waves. It outlines the properties of delay devices, filters and resonators. It provides an indication to the state of the art of these technologies in Czechoslovakia.

In addition to optoelectronics, one of the viable trends in the development of functional microelectronics is represented by acoustoelectronics. This sphere of technology uses volume or acoustic surface waves for processing signals. The use of acoustic volume waves in electronics is well known and forms the basis of the operation of piezoceramic resonators and delay devices. We shall concentrate our attention in this article primarily on the applications of acoustic surface waves, because the technical public is not sufficiently familiar with the potential they offer and with their properties; it is their favorable properties that account for their recently constantly expanding applications.

The basic advantages offered by acoustic surface waves, i.e., slow speed of propagation, relatively low losses due to propagation, and high conversion efficiency, have attracted the attention of designers of radioelectronic systems for a long time. The potential applications of acoustic surface waves have lately undergone a great expansion in connection with the availability of improved effective and technologically easily built piezoelectric converters operating in a wide frequency range, up to several GHz, and also in connection with the industry's acquisition of proficiency in the production of perfect monocrystals. All this became reflected in a larger assortment and improved quality of the properties of acoustoelectronic systems, where wide application of these elements is promoted by such properties as miniaturization, stability

of properties, high technical level of production, etc. Acoustoelectronic devices are currently finding application in radiolocation, telecommunications, television, systems for processing signals for most varied uses, etc. Most devices are designed for systems that are produced in small series, where basic design considerations are not concentrated on economic problems, but on achievement of optimum properties. An exception is formed by acoustoelectronic filters for intermediate-frequency amplifiers of television receivers, to a smaller extent for telecommunication receivers, multiplexes and small radars. This article describes properties of the most widely used acoustoelectronic elements and devices with acoustic surface waves and shows the current state of the art of this technology in the CSSR.

1. Properties of Acoustic Surface Waves

The properties of acoustic surface waves (PAV) were described in 1885 by Lord Rayleigh [1]. (That is why they are sometimes referred to as Rayleigh's waves.) They represent elliptically polarized plane mechanical waves, propagating in the thin boundary layer between solid phase substance and air. Amplitude of oscillations decreases very rapidly with distance from the boundary, and at a depth of several wavelengths it practically disappears. Particle motion can be divided into two orthogonal components, one parallel to the direction of propagation, the other perpendicular to the boundary, as shown in Figure 1.

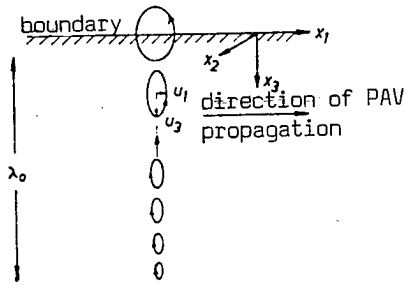

Figure 1. Illustrated motion of particles in an acoustic surface wave u_1, u_3 are components of the displacement vector

Increased interest in PAV's is due to several specific properties of these waves. First of all, their velocity of propagation in the most frequently used substances ranges between 1.2 to 12 km/s and is consequently lower by 10^5 than that of electromagnetic waves. This greatly enhances the miniaturization of circuit elements which depend for their size on wavelength (e.g., filters, resonators, delaying devices, etc.).

Another outstanding property of these waves is the fact that they propagate practically along the surface of substances and, consequently, are available at any random point and along the entire path of propagation. This makes it possible to influence the direction of propagation by changes in the properties of an elastic surface and generate in this manner waveguides

resembling those for electromagnetic waves. PAV's can also be directly influenced in a piezoelectric substance by interaction with an external electric field or with free charge carriers in a semiconductor, and thus achieve amplification.

Another favorable property of PAV devices is the relative simplicity of their production process, in which conventional photolithography, which is known and widely used in production of integrated circuits, finds application.

Acoustoelectronic devices with acoustic surface waves are routinely used in the 3 MHz to 3 GHz frequency band. The lower frequency limit is determined by the practically attainable dimensions of the used piezoelectric substrates and the range of velocities of propagation of PAV's in such substances. Devices with a low operational frequency are bulky and, at any rate, it is better to use other methods for signal processing (e.g., acoustic volume waves, LC circuits, electromechanic devices, etc.). The upper frequency limit is delineated by logic difficulties encountered in devising narrow converter electrodes, PAV velocities and loss mechanisms dependent on frequency. In the use of common piezoelectric substances, such as, e.g., $LiNbO_3$, $Bi_{12}GeO_{20}$, SiO_2, the dimensions of interdigital converter electrodes come out at a frequency of 1 GHz less than 1 μm, so that use of conventional technology in devising them is difficult. Electron lithography offers a way out of this predicament.

2. The Functioning Principle of Devices With Acoustic Surface Waves

The practical application of PAV properties called for the discovery of effective methods and systems for their generation and reception throughout the frequency range of their application. Many such systems are in existence [2]. However, the best results were obtained by means of an interdigital converter (IDM) formed by two arrays of comb-like metal electrodes deposited by vaporization or in some other way on the surface of the piezoelectric substance, as shown in Figure 2.

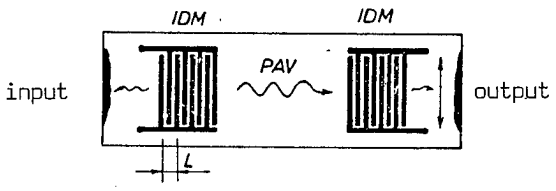

Figure 2. Schematic diagram of OV with constant delay time

When the converter electrodes are connected to a source of a.c. voltage there occurs between them an electric field changing in time and space which as the result of an indirect piezoelectric phenomenon generates PAV's propagating in both directions. The wave propagating to the left is usually attenuated in the absorption medium at the edge of the substrate. The wave propagating to the right becomes changed in the second IDM by a direct piezoelectric phenomenon into an electric signal. Most effectively generated and received will be PAV which meet the condition of synchronization, expressed by equality

of the spatial period of the converter L (Figure 2) and wavelength λ_0 of the generated surface wave, i.e.,

$$L = \lambda_0 = v/f_0. \tag{1}$$

From equation (1) it follows that in an operational frequency range of 3 MHz to 3 GHz and at normal speeds of PAV propagation the spatial period of the converter is 1 mm to 1 μm. Surface waves with a frequency differing from f_0 are generated with less efficiency. Thus, conversion of the incoming electric signal by the converter into PAV and reconversion of PAV into an electric signal is frequency dependent, allowing for the IDM to be used as a frequency selection element.

The IDM structure, i.e., spatial period, number of electrodes, their length (aperture) and arrangement, determine the operational frequency, the past band width, the configuration of frequency characteristic and losses. The distance between input and output converters and PAV velocity of propagation determine the lag of signal. Overall efficiency of conversion depends on the coefficient of electromechanic linkage k^2.

The frequency characteristic can be derived by means of the analogy between the IDM and, e.g., the antenna system. It turns out [3] that amplitude characteristic has the form of function sinc x (Figure 3) and that the phase characteristic is linear.

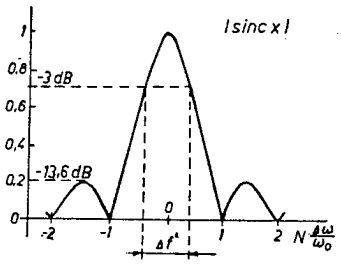

Figure 3. Amplitude characteristic of IDM

As the simplest device consists of two IDM's, the resultant characteristic is determined by both converters. When both have an equal number of electrodes and an equal synchronous frequency, the amplitude characteristic is the product of characteristics of both converters. Thus, it has the form of function sinc^2 x, as is shown in Figure 4. The phase characteristic is again linear.

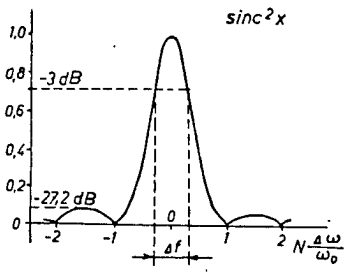

Figure 4. Amplitude characteristics of a simple planar filter with equal input and output IDM

The form of frequency characteristic can be influenced by use of the so-called weighted IDM. The following weighting methods are applied:

1. Weighting by change in the overlap of electrodes (called also apodization), whereby electrode width and gap remain constant (Figure 5a).

2. Weighting by change in the distance between electrodes, whereby the distance between adjacent electrodes changes while the overlap remains constant (Figure 5b).

3. Weighting by change in the polarity of electrodes, whereby there occurs a change in the sequence of electrode connections to common busbars (Figure 5c).

4. Weighting by change in the width of electrodes, whereby distance and overlap remain constant and the ratio electrode/gap changes (Figure 5d).

5. Weighting by leaving out selected electrodes, whereby some electrodes are left out in keeping with the desired weighting function (Figure 5e).

6. Weighting by transverse division of electrodes (serial weighting), whereby pairs of IDM electrodes are divided into sections in a transverse direction (Figure 5f).

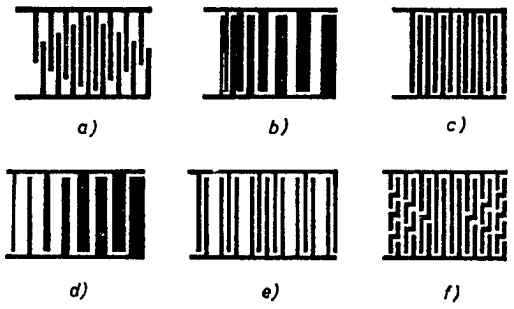

Figure 5. IDM weighting methods

The use of weighted converters makes it possible to make acoustoelectronic devices that have the requisite properties.

In some devices it is advisable to use a multistrip coupling element (MVC). This is a system of insulated metallic electrodes positioned perpendicularly to the direction of PAV propagation, as shown in Figure 6. This acousto-electronic element provides mutual linkage for two acoustic paths (A, B) in which IDM's are usually positioned. PAV's impacting on an MVC in the upper path generate in its electrodes electric voltage which then generates PAV's in the lower path B. Full transfer of energy calls for a certain number of electrodes that is commensurate to $1/k^2$. MVC's find wide application in contemporary acoustoelectronic devices in which, depending on the distance between electrodes and their number, they perform the most varied functions. They can be used as directional couplers, reflection systems, elements of unidirectional IDM's, compression filters, etc. In addition, the MVC is an effective means for suppressing acoustic volume waves that are generated in devices with PAV's.

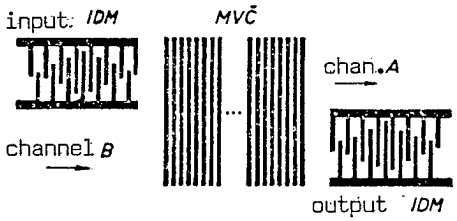

Figure 6. Use of a multistrip coupling element

3. Use of Acoustic Surface Waves in Electronic Devices

Even though PAV applications are multifaceted, at the present time it is possible to point out two basic directions for their application. The first direction is research and development of elements and systems with PAV's for processing electric signals, which we shall examine in closer detail later. The second direction is oriented toward the making of acoustoelectronic systems constituting analog elements used in microwave technology. They are waveguides, directional couplers, high-performance dividers, phase controllers, etc. The outlook for development in these directions is given primarily by the specific properties of PAV's.

Delay Devices

The first acoustoelectronic systems to find application in electronics were delay devices (OV) with a constant delay time. The basic demands made on OV's are: a wide range of delay and operational frequencies, as wide a pass band as possible and low losses. From among the known OV types, those with PAV's meet these requirements most fully. They delay an electric signal in a range of 0.1 to 1 ms in the frequency band of 3 MHz to 3 GHz with pass band width for 100 percent of operational frequency.

OV's with constant delay can be divided into two groups: OV's with short delay (up to 100 μs) and with long delay (100 to 1,000 μs). Delay up to 100 μs can be achieved by selecting the distance between the input and output converters. OV's of the first group can use a conventional arrangement with two converters on a piezoelectric substrate, or with one converter and a reflection system. The path of PAV propagation in OV's with long delay is complex. Two configurations are most often resorted to: OV's with rounded substrate edges and OV's with a complex path of propagation on one side of the substrate (disk OV). OV's with rounded edges can have a closed path of propagation (cylindrical OV) or a spiral path of propagation (spiral OV). Figure 7 shows a cylindrical OV. Opposite sides of the substrate are rounded and on its surface are suspended the input and output IDM's. Losses per contact range between 1.5 to 5 dB [4]. Figure 8 shows modifications of a cylindrical OV. Recirculation of the signal is eliminated by means of an absorption substance located on the surface of the substrate (Figure 8a). The second modification of the cylindrical OV differs in the adaptation of its substrate. This adaptation eliminates the effect of propagation of undesirable volume waves from the input to the output IDM. An OV with a spiral path is shown in Figure 9. Delays of up to 1 ms [5] can be achieved with these OV's. Figure 10 shows a disk OV with tetragonal and triangular paths. The directions of propagation attainable in these OV's with a disk of 7.62 cm diameter at a frequency of 41 MHz is 169 μs at losses of 5 dB [6].

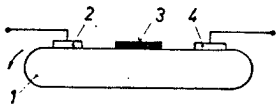

Figure 7. Cylindrical OV

Key:
1. substrate
2. input IDM
3. PAV amplifier
4. output IDM

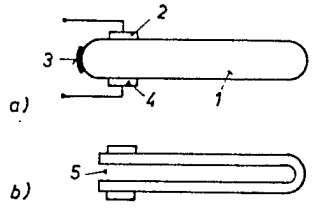

Figure 8. Modifications of cylindrical OV

Key:
1. substrate
2. input IDM
3. absorption substance
4. output IDM
5. slot

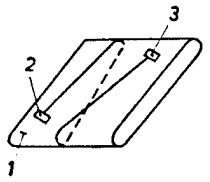

Figure 9. Spiral OV

Key:
1. substrate
2. input IDM
3. output IDM

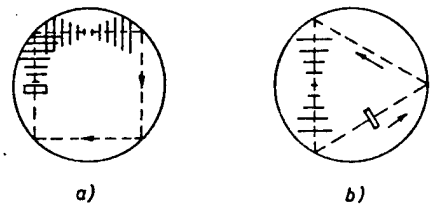

Figure 10. Disk OV

Key:
a) with tetragonal propagation path
b) with triangular propagation path

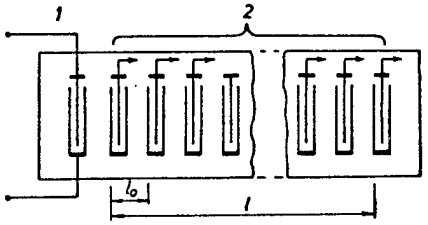

Figure 11. OV with adjustable delay

Key:
1. input IDM
2. output IDM

In addition to OV's with constant delay, frequent use is made of OV's with adjustable delay. Discrete regulation can be achieved by, e.g., Figure 11. The output IDM is formed by a set of IDM's at a mutual distance of l_o. The extent of regulation is delineated by the number of output converters. Continuous regulation can be achieved by changing the velocity of PAV propagation.

Filters

The key position among acoustoelectronic devices is occupied by filters that generally have the following properties:

1. The progress of their amplitude characteristic can be random, but they function only as band pass filters.

2. Their phase characteristic is principally linear and can be shaped at random in case of need.

3. They are of miniature dimensions, inexpensive, with a high stability of properties and reproducibility.

4. They have no adjusting elements and they need not be adjusted.

5. They show little sensitivity to external dispersion fields and to changes in temperature.

Some attainable characteristics of band pass filters are shown in Table 1.

Table 1. Attainable Filter Characteristics

Operational frequency	1 MHz to 3 MHz
Minimum initial input losses	0.5 dB
Maximum relative bandwidth	100%
Suppression of side-band	90 dB
Minimum width of pass band	100 kHz
Minimum width of heat-affected zone	100 kHz
Suppression of triple transmission signal	60 dB
Amplitude of ripple effect in band pass characteristic	± 0.02 dB
Deviation between phase and linear characteristic	± 0.1°

The simplest filter consists of an input and an output IDM. The frequency characteristic has the form shown in Figure 4. Weighted IDM's are used to obtain a different form of amplitude characteristic. In filter synthesis it is possible to follow, e.g., the Fourier transformation method. In so doing, the desired transmission function is subjected to Fourier's transformation according to the ratio:

$$h(t) = \int_{-\infty}^{\infty} H(\omega)\, e^{j\omega t}\, d\omega. \qquad (2)$$

In this way pulse response is obtained. If we adjust the length of electrodes of one IDM according to this response and the second IDM has a wide band (with a low number of electrodes), then the filter will possess the desired transfer function. However, from equation (2) follows that Fourier's transformation of a rectangular transfer function is a pulse response in the form of function sinc x unlimited in time. This means that to devise

a filter with such a characteristic it would be necessary to use an infinitely long apodized IDM. Delimitation h(t) results in the appearance of a ripple effect in H(ω) (the so-called Gibbs effect) and change of rectangular amplitude characteristic into trapezoidal. A considerable reduction of the effects of delimitation h(t) can be achieved by using the method of weighting functions, which consists in multiplying h(t) by a certain symmetrical function with values contiguously diminishing at interval boundaries (-T, T). An often used weighting function is Hamming's function:

$$w(t) = \begin{cases} 0{,}54 + 0{,}46 \cos(\pi t/\tau) & |t| < T \\ 0 & |t| > T, \end{cases} \tag{3}$$

where T is length of bounded pulse response.

In using this function the amplitude of lateral lobes does not exceed the value of 0.5 percent. There are many other suitable functions [7]. The progress of filter synthesis by means of the method of Fourier's transformation and weighting functions is shown in Figure 12. A more complex method is used in the synthesis of filters with an asymmetrical characteristic or filters with a nonlinear phase characteristic [8].

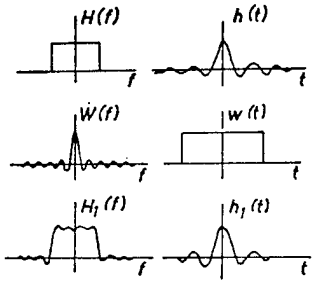

Figure 12. Progress of filter synthesis by means of the Fourier's transformation method and weighting functions

An interesting group of planar filters, as acoustoelectronic filters with PAV's are sometimes called, is formed by adaptable filters. They facilitate the operational tuning adjustment of the filters' amplitude characteristic according to the mode of operation. An example of an adaptable filter is shown in Figure 13.

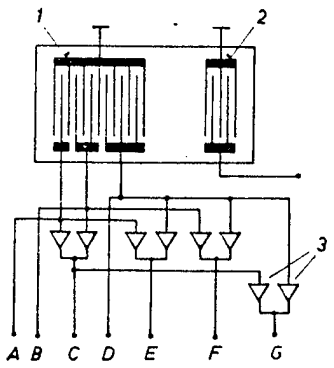

Figure 13. Adaptable filter

Key:

1. set of output IDM's
2. input IDM
3. buffer amplifiers

It is essentially a band pass filter consisting of an input IDM which determines the width of the filter's transmission band and a system of output wideband IDM's. The signal from individual output IDM's is added in certain combinations through buffer amplifiers. At the output of amplifiers A-G are formed amplitude characteristics which correspond to the number of connected converter electrodes (Figure 14). There are various modifications of these filters [9], but all are characterized by the use of IDM's together with semiconducting coupling elements.

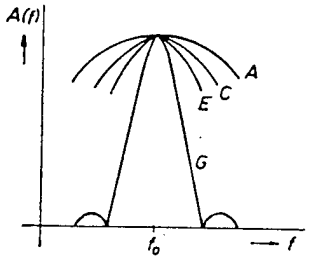

Figure 14. Amplitude characteristic of an adaptable filter

In addition to the types of filters mentioned, of great interest from a practical viewpoint are compression and adapted filters.

Compression filters find application in radar technology for shaping short pulses with high energy. Use is made of IDM's weighted by changing the distance between electrodes and by changing the polarity of electrodes. The principle of a compression filter's operation is shown in Figure 15. It makes use of the properties of Barker's 5-bit code, whereby the amplitude of lateral lobes of the output signal is five times smaller than that of the main lobe and the entire energy is for all practical purposes concentrated

in the main lobe. A 7-bit, 13-bit Barker's code, or Golay's progression [10] are used to achieve higher compression.

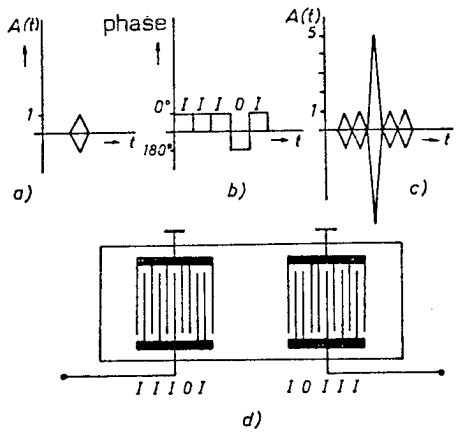

Figure 15. Compression filter

Key:
a) input pulse
b) PAV configuration between IDM's
c) output pulse
d) filter design

If the probable shape of received signals is known, adapted filters make it possible to separate these signals from (white) noise. Weighted converters [11] are used in their design.

Resonators

Other acoustoelectronic devices that have found wide application in electronics are resonators. The basic element of a resonator is the reflective structure formed on the substrate's surface (Figure 16). Reflective structures can be formed by, e.g., thin metallic strips or by etched grooves. IDM's are used for the removal of energy from resonators. Depending of the number and arrangement of IDM's in the reflective structure, resonators can be either single converter or double converter with external or internal IDM's.

[Figure 16, next page]

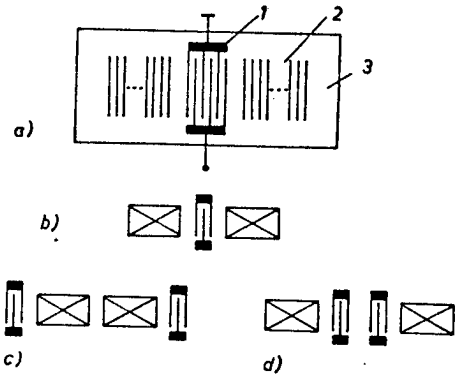

Figure 16. Planar resonator

Key;

a) structural arrangement:
   1. converter
   2. reflective structure
   3. substrate
b) diagram of a single converter resonator with internal IDM
c) double converter resonator with external IDM 's
d) double converter resonator with internal IDM's

Contrary to volume wave resonators, the favorable property of PAV resonators is independence of substrate dimensions of resonant frequency and its simple construction. The quality factor reaches values of 10^3 to 10^4 and initial input losses in a double converter resonator amount to 5 to 7 dB [12].

The resonator can be adjusted by tuning in one of several ways. The most effective method is the use of an additional IDM. A change in IDM load impedance affects the velocity of PAV propagation and, consequently, also the resonant frequency, which can be changed in a range of 1 to 5 x 10^{-3}.

A double converter resonator is used as a narrow-band filter with relative band-width of 0.01 to 0.1 percent, whereby its dimensions are considerably smaller than those of a conventional DC filter. Resonators also find use as frequency selective elements in generators. An electric signal generator with an acoustoelectronic resonator is shown in Figure 17. Stability of frequency is on the order of 10^{-5} per year [13].

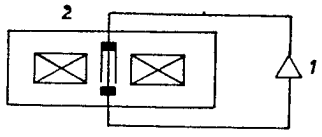

Figure 17. Electric signals generator with a PAV resonator

Key:

1. amplifier
2. single converter resonator

4. Other Potential Applications

The preceding text has indicated some directions in the practical application of acoustoelectronic elements with PAV's. It stands to reason that their applications are much wider. Some of these potential applications will be briefly enumerated below.

Practical results were achieved in the area of using PAV's in the modulation of light beams for optoelectronic purposes. The possibilities for direct amplification of PAV's are being researched. Acoustoelectronic waveguides can be used in the construction of portable radar systems. PAV's find use in measuring of high pressures, temperatures, radioactive radiation, etc.

5. Current State of the Art in Czechoslovakia

The problems of acoustoelectronic elements with PAV's are dealt with by several work centers at institutions of higher learning and in research institutes. The scope of the studied problems is wide and includes the following areas:

1. Research of the properties of delay lines, resonators and filters, including their practical design and construction, research into the properties of waveguide propagation of PAV's, research of optical methods for measuring the properties of elements and devices with PAV's, including visualization of processes and research of metrological methods and techniques for measurement of acoustoelectronic elements and devices.

2. Research into the properties of piezoelectric substances from the viewpoint of volume and acoustic surface waves.

3. Research into acoustooptical light modulators.

4. Research into the properties of multistrip coupling elements and their design.

5. Research into the technology for the production of acoustoelectronic elements and piezoelectric monocrystals.

It can be stated that the problems of design and construction of filters, delay lines, resonators and MVC's are managed with sufficient proficiency and that these systems can be designed to preferred specifications. More than 30 acoustoelectronic devices with PAV's were designed and built in the past. Samples of selected prototypes of such devices designed at the Transportation and Communications College in Zilina are shown in Figures 18-20. A television intermediate-frequency filter PBF 101 was designed and constructed recently and is ready for serial production (Figure 21) [14].

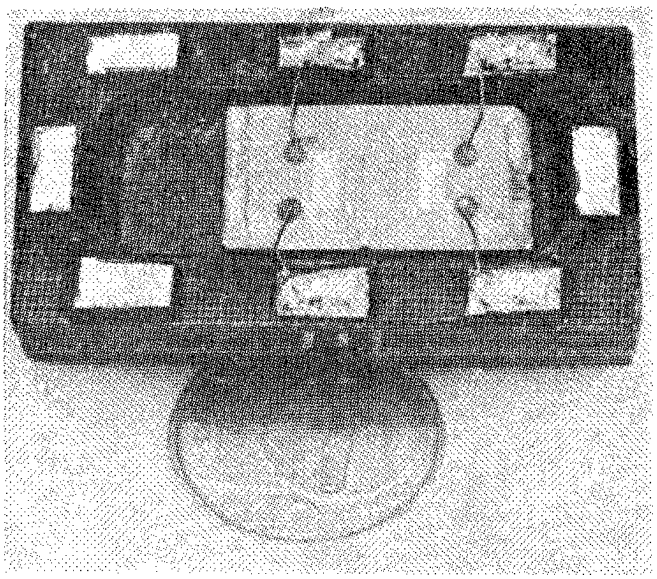

Figure 18. Delay line 1.6 μs, 39.5 MHz on substrate of YX-SiO_2.

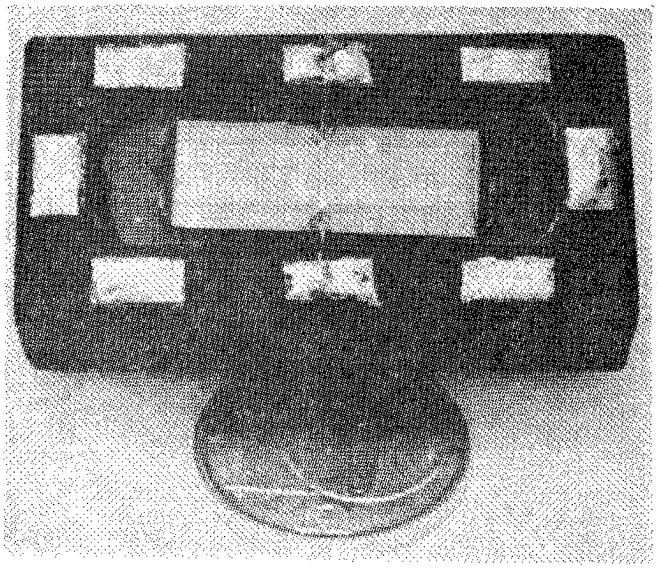

Figure 19. Single converter resonator on substrate YZ-$LiNbO_3$, f_r = 43.64 MHz, Q = 720.

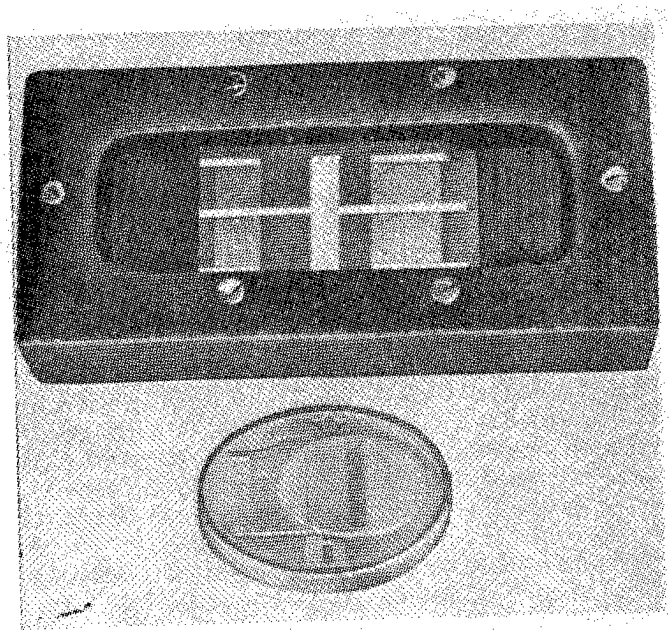

Figure 20. Input filter of TVP audio channel with synchronous frequency of 5.5 MHz and 6.5 MHz on substrate of $Bi_{12}GeO_{20}$.

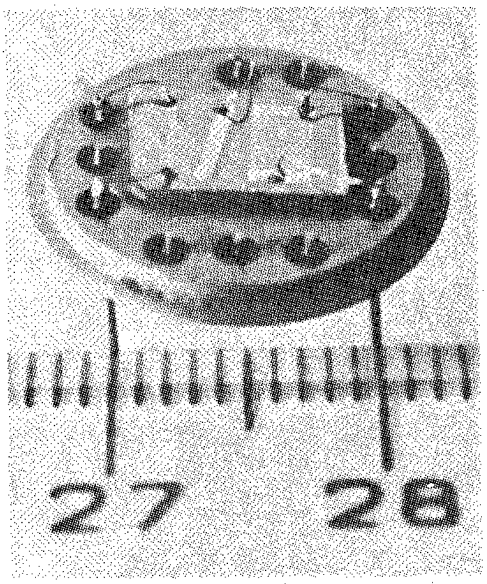

Figure 21. Television intermediate-frequency filter PBF 101 on substrate made of $Bi_{12}GeO_{20}$.

6. Conclusion

This article has described the basic properties and advantages offered by the use of acoustic surface waves in the processing of electric signals. Another part explained the principles of operation of selected acousto-electronic elements and devices, such as delay lines, filters and resonators, that are lately finding application in the construction of electronic systems. Selected prototypes of these devices were also shown.

BIBLIOGRAPHY

1. Rayleigh, J. W. S., "On Waves Propagated Along the Plant Surface of an Elastic Solid," Prod. London Math. Soc., 17, 1885.

2. Viktorov, I. A., "Physical Principles for the Application of Ultrasonic Waves of Rayleigh and Lemb in Technology," Moscow, Nauka 1966.

3. Matthews, H. (ed.), "Surface Wave Filters," New York, John Wiley 1977.

4. Coldren, L.A., "Optimizing Less-Compensated Long Delay Devices," IEEE Trans., SU-20, No 1, 1973.

5. Co, F., Hunsinger, B. and Lawson, R., "Surface Waves Circulating on Piezoelectric Substrates," Appl. Phys. Letts., 18, No 7, 1971.

6. Mason, I. M., Papadofrangakis, E. and Chambers, J., "Acousto-Surface-Wave Disk Delay Lines," Proc. IEEE, 64, No 5, 1976.

7. Karinsky, S. S., "Signal Processing Systems on Ultrasonic Surface Waves," Moscow, SOVIETSKOE RADIO 1975.

8. Oliner, A. A. (ed.), "Acoustic Surface Waves," Berlin, Springer Publ. 1978.

9. Stamples, E. J. and Claiborne, L. T., "A Review of Device Technology for Programmable Surface-Wave Filters," IEEE Trans., MTT-21, No 4, 1973.

10. Gerard, H. M., "Design and Applications of Highly Dispersive Acoustic Surface Wave Filters," IEEE Trans., MTT-21, No 4, 1973.

11. Jones, W. S., et al., "Evaluation of Digitally Coded Acoustic Surface Wave Matched Filters," IEEE Trans., SU-18, No 1, 1971.

12. Nevesely, M., "Analysis and Design of a Resonator for Elastic Surface Waves," Thesis, Transportation and Communications College, Zilina 1977.

13. Nevesely, M., "Interdigital Converter of Elastic Surface Waves as a Selective Element for High-Frequency Generators of Electric Signals," ELEKTROTECHNICKY CASOPIS, 30, No 8, 1979.

14. Nevesely, M. and Sonsky, M., "Design and Structural Layout of the PBF 101 Television Intermediate-Frequency Filter with Acoustic Surface Wave," SLABOPROUDY OBZOR, forthcoming.

New Integrated Circuit Casings

Prague SLABOPROUDY OBZOR in Czech No 12, 1983 pp 595-596

[Article by Eng Vladimir Muenz, Tesla--Telecommunications Research Institute, Prague: "Prospective Casings of Integrated Circuits for Telecommunication Systems"]

[Text] The transition from analog to digital communication systems makes it possible, as in computer technology, to expand more rapidly the number of functions in an integrated circuit. The large attained number of elements on a chip and their specialized connection constitutes a substantial part of a specific system leading to custom or semicustom design of LSI or VLSI circuits. Increases are made at the same time in chip area and the number of outlets.

The desire to reduce losses in the increased density of elements achieved on a chip to an absolute minimum had led to demands for new casings. In addition to conventional double-row DIP casings, there have begun to appear, mainly due to larger numbers of outlets, chip carriers (CC) on a ceramic or plastic base, and chips mounted by means of an auxiliary foil carrier (technology TAB). The key characteristic of new casings are their smaller dimensions (Figure 1).

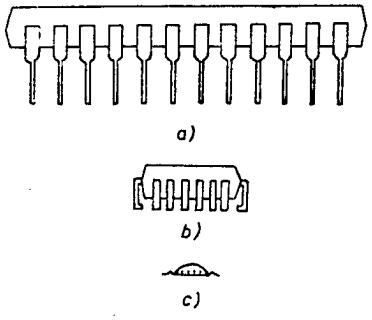

Figure 1. a) Double-row casing (DIP), 24 outlets, spacing 2.54 mm;
b) Chip carrier (CC) with elastic outlets, 24 outlets, spacing 1.27 mm;
c) Chip cut from an auxiliary plastic carrier (technology TAB), 24 outlets, spacing 0.50 mm.

The application of chip carriers in, e.g., the ITT 1240 digital exchange [1], along with a new concept of the rear interconnecting panel, are considered by their designers to be the two basic innovations of the system. Ceramic chip carriers with 64 elastic outlets find application in custom-designed LSI coupling circuits and in reception and transmission circuits mounted on six- or four-layer plates with printed circuits. The production of 200,000 subscriber terminals calls for 90,000 ceramic chip carriers with 64 outlets each.

Another example is the design of an 8-bit microcomputer for telecommunication purposes [2]. Use of ceramic chip carriers without outlets with 44 contact surfaces makes it possible to achieve a reduction in the number of DIP casings in the ratio of 6:1. Selected properties of DIP, CC and TAB casings and carriers are listed in Table 1.

Casings in TAB technology are the smallest, but also the most demanding on technological changes to be implemented by the semiconductors' producer; they call for additional masks for forming projections on chips and the introduction of new procedures in the mounting of chips on auxiliary carriers, including production of the latter. To obviate the necessity for changes on the part of a producer of semiconductors, the variant adopted in the CSSR was WTAB, in which use was made of unprocessed chips that were contacted by free carriers. Despite these measures, mounting on auxiliary foil carrier is technologically demanding on special equipment and can become economically feasible only after individual types of chips--for which there is currently no demand in the CSSR--are produced in large series. Furthermore, mounting in hybrid circuits--where utilization of WTAB technology was primarily considered--calls for special contacting equipment directly available to their producer. These circumstances led to the discontinuance of operations involving WTAB technology, this measure being also undoubtedly abetted by the possibility of providing for the production of ceramic chip carriers in the CSSR by the Tesla concern enterprise in Hradec Kralove by expansion of the license procured from the Japanese Kyocera company to cover ceramic double-row DIP casings.

Ceramic or plastic carriers contain outlets on all four sides of the square casing. Continued reduction of dimensions--in comparison with double-row casings--is occurring through closer spacing of outlets at 1.27 or 1.00 mm. At the present time they are produced by, e.g., 3M, Kyocera, Texas Instruments and Northern Telecom. They offer a number of advantages [2] in comparison to double-row DIP casings. The area of a printed circuit plate taken up by a chip carrier is approximately one-third that of an equivalent DIP casing, whereby the area dimension of the carrier is reduced to as little as one-fifth (see Table 1). The reduction in price to approximately one-half for smaller numbers of outlets and to as little as approximately one-fourth for more than 64 outlets is significant. The prerequisites for higher transmission speeds a manifold reduction (by as much as 1 order) of resistance, inductance and capacity of conductive networks. Chip carriers can be test measured and thermally implanted just as chips in double-row casings, whereby no change occurs in their reliability. They make it possible to use outlet numbers in excess of 64, which constitutes the attained limit for double-row casings. Some types of chip carriers can be used both for printed circuits and hybrid circuits. There is a further potential for increasing the relative density of components by decreasing the gaps between printed circuit plates, because chip carriers extend over the plate up to a maximum of only 2.5 mm.

At the present time standardization of chip carrier types within JEDEC (Joint Electron Device Engineering Council) JC 11-3 is progressing. Provisions are being made for the introduction of ceramic and plastic chip carriers that constitute a variant of the ceramic and plastic double-row

Table 1. Selected Properties of Casings for Integrated Circuits

Item	Double-row casing (DIP)	Chip Carrier (CC)				Chip mounted by auxiliary plastic carrier (TAB)
		Ceramic w/o outlets		Ceramic w/ outlets	Plastic w/ outlets	
Spacing of outlets (mm)	2.54	1.0	1.27	1.27	1.27	0.5
Number of outlets	14-40 (64)	16 to 156				about same as chip carrier
External dimensions of a casing w/ 40 outlets (mm)	50.80x 15.24	10.16x 10.16	16.51x 16.51	about same as plastic carrier with	17.00x 17.00	6.35x6.35
Area of casing on plate element	774.2	103.2	272.6	outlet	289.0	40.3
Mounting of casing on plate/element	plates with printed circuits	hybrid circuits, subplates and plates with printed circuits				integrated and hybrid circuits, plates with printed circuits
Contacting of casing	wave soldering	remelting and wave soldering				welding, remelting, soldering
Envisioned production (%)						
in 1985	60-65	20-30				10-15
in 1990	40-45	40-50				10-15
References	[3, 6]	[4, 5, 7]				[8, 9]

casings. Ceramic chip carriers, the production and standardization of which started earlier, come in seven versions, of which four use outlets in the form of screen-print areas, the so-called leadless version, and three have miniature elastic outlets, the so-called leaded version. The spacing in leadless types is 1.0 or 1.27 mm, while the only spacing considered for leaded types is 1.27 mm. Ceramic carriers with leadout spacing of 1.0 mm are intended primarily for ceramic hybrid circuit plates and/or printed circuit subplates. Carriers with 1.27 mm spacing are used for printed circuits. The carriers intended for printed circuit plates requiring resistance against changes in temperature use elastic outlets which compensate for the coefficients of thermal expansion of ceramic and plastic materials.

As was already pointed out, chip carriers can be mounted in hybrid circuits as well as in printed circuit plates. The most effective mounting on plastic or ceramic plates is printing with soldering in vapors. The higher density of mounting on printed circuit plates--achieved by reducing the dimensions of integrated circuit casings--calls for improving the thermal and mechanical properties of plates. The introduction of new types of integrated circuit casings places new demands not only on the producer of semiconductors, but also on the final producer who must introduce, e.g., planar mounting of carriers on printed circuit plates and improve the properties of the plates.

Chip carriers will find application in telecommunications systems primarily in custom-designed circuits of high integration. For standard integrated circuits they will find application mainly in hybrid technology, where they will facilitate test-measuring of individual chips and, thus, mounting of complex hybrid circuits with a low reject rate.

BIBLIOGRAPHY

1. Pahud, P. and Perga, A. L., "ITT 1240 Digital Exchange Manufacture and Installation," ELECTRICAL COMMUN., Vol 56, No 2/3, p 292, 1981.

2. Stafford, J. W., "Chip Carriers--Their Application and Future Direction," IEEE Trans. on Comp., Hybrids and Manufacturing Technology, CHMT-4, No 2, pp 195-199, 1981.

3. Final Report TPTE 55-1/81 of Tesla in Hradec Kralove on Multilayer Ceramic Casings for Integrated Circuits.

4. Kyocera Company Catalogue.

5. Orcutt, J., "Printed Circuits Get a New Boarder: The Plastic Leaded Chip Carrier," ELECTRONICS No 7, pp 141-145, 1982.

6. Dounelly, E., "Can Current Laminates Meet Future Interconnection Needs?" ELECTRONIC PRODUCTION No 2, pp 11-15, 33, 1982.

7. St. Louis, J., Thumm, M., Ribot, P. and Gale, G. N., "Low Cost Chip Carriers for the 1980's," IEEE Trans. on Comp., Hybrids and Manufacturing Technology, CHMT-4, No 2, pp 205-209, 1981.

8. Dais, J. L., Erich, J. S. and Jaffe, D., "Face-Down TAB for Hybrids," IEEE Trans. on Comp., Hybrids and Manufacturing Technology, CHMT-3, No 4, pp 623-633, 1980.

9. de Miranda, W. R. Rodriques, Oswald, R. G. and Brown, D., "Lead Forming and Outer Lead Bond Pattern Design for Tape-Bonded Hybrids," IEEE Trans. on Comp., Hybrids and Manufacturing Technology, CHMT-1, No 4, pp 377-383, 1978.

Exhibit of New Technology

Prague SLABOPROUDY OBZOR in Czech No 12, 1983 pp 604-611

[Article by Eng Josef Trnka, CSc, and Dr Rudolf Ritter: "Days of New Technology in Electronic Research 1983"]

[Text] This year's "Days of New Technology in Electronic Research 1983" were held on 9-17 June in the facilities of the District House of Culture in Prague 4. They continued the many years of tradition of the Days of New Technology of Tesla's Research Institute for Communications Technology of A. S. Popov (Tesla-VUST) of the 1960's and 1970's and the tradition, restored in 1980, of joint expositions by Tesla's research institutes and the expositions held by organizations within the jurisdiction of the CSAV [Czechoslovak Academy of Sciences] and FMEP [Federal Ministry of Electrotechnical Industry] last year.

This year's DNT [Days of New Technology] were participated in by as many as 50 organizations from 7 ministerial sectors. DNT thus provided the technical public with an extraordinary opportunity for assessing the results of scientific and technological R&D attained by Czechoslovak electronics as well as its potential for meeting the demanding social tasks called for by the currently progressing stage of electronization of the national economy. The most highly represented sector was the electrotechnical industry, represented--in addition to the main sponsor, Tesla-VUST--by the Research Institute of High-Voltage Electrotechnical Engineering (VUSE), the Research Institute for Mechanization and Automation (VUMA), and 23 additional specialized and production organizations of the concerns Tesla-Electronic Components, Tesla-Investment Electronics, Tesla-Metrological and Laboratory Instrumentation, Tesla-Consumer Electronics and the Automation and Computer Technology Enterprises. The CSAV and SAV [Slovak Academy of Sciences] were represented by the Institute of Radio Engineering and Electronics (URE), the Institute of Nuclear Physics (UJF), the Geophysical Institute (GFU), the Institute of Instrumentation Technology (UPT), the Joint Laboratory for Chemistry and Technology of Silicates (SLCHTS), the Electrotechnical Engineering Institute (EU) and the Institute for Metrology and Metrological Technology (UMMT). A newly added feature was the exposition staged by the Association for Cooperation with the Army

(Svazarm), carrying out significant tasks in the technical preparation of the technically oriented public and of youth, that was prepared by 10 organizations and enterprises, as well as participation by other exhibitors from the CVUT [Czech Institute of Engineering], the Slovak Hydrometeorological Institute (SHU) and the Communications Installation Enterprise (MPS).

This outline of participants indicates the wide scope and variety of this year's DNT, which presented some 150 exhibits divided into thematic units comprising materials for electronics, the components and spare parts base, microwave technology, optoelectronics, communications technology, vacuum, consumer and medical electronics, digital, automation, metrological and laboratory technology and nuclear engineering instrumentation.

The attained results were evaluated by two panels of experts that awarded 13 honorary citations to the best DNP exhibits.

Materials for Electronics

The main attention of the technical public was devoted to demonstrations of new materials and fibers for optoelectronics exhibited by SLCHTS:

--chalcogennous glasses based on As_2S_3, As_2Se_3, As-Se-Ge, As-Se-Sb, Ge-Se-Te, that can be used as optical elements in the infrared (IR) spectral region and in the preparation of fibers for energy transmission;

--PCS-type light-conducting glass fiber for Czechoslovak transmission systems of the first generation (attenuation below 15 dB/km);

--PCT-type light-conducting glass fiber with protective sheathing made of tefzel providing outstanding flexibility and resistance against both mechanical and chemical damage to the silicone sheath;

--light-conducting glass fiber withstanding abrupt changes in the index of refraction and with a polymer protective coating resistant to temperatures ranging between -55 and 350°C (attenuation 25 dB/km, diameter including sheathing 184 μm).

The first two of the above exhibits were awarded an honorary citation by the CSAV panel of experts.

Tesla-VUST demonstrated reproducible preparation of complex epitaxial GaAs structures with the use of the Soviet EPIGAR I system by means of the chloride transport method (VPE) and materials developed for preparation of electrochemical sources of higher energo-capacitance properties (cells Ni-Cd and Li-CF_x).

Components for Electronics

The results attained in the area of microelectronic components were demonstrated by Tesla-VUST by an additional expansion of CMOS circuits

(mostly equivalents of RCA's CD 4000 series), characterized by low energy consumption, specifically the types MHB 4006, 4015, 4035, 4047, 4066, 4068, 4543, 6551 (equivalent to INTERSIL 6561) and 0320 (equivalent to HUGHES HCTR 0320); the concern enterprise Tesla of Piestany introduced circuits for computer and microcomputer technology prepared for production start-up in the current year, particularly MHB 2102A, MHB 4116C, MHB 8707, MHB 8255A, MHB 8251, MHB 2114, MHB 1902, MHB 8804 and the central processing unit MHB 8080A.

For a series of prospective transmitter hf loads in bands up to 500 MHz with an output of up to 100 W the Tesla-VUST developed a load resistor in the form of a strip line which made it possible to reduce its dimensions considerably (100x70x280, including the cooler) while maintaining good electric properties. Noise filters developed in VUSE--low-pass filters with 60 dB insertion loss which must be used, e.g., in products with operational semiconductor components--serve to suppress interference voltages in the 150 kHz to 30 MHz band. The advantages offered by thin-layer tantalum technology in the production of hybrid active RC filters in lf technology with high thermal and chronological stability were confirmed by VUEK and Tesla-VUT through a demonstration of samples for R2 code signalization in telephone exchanges. Miniature JRM 1Z and JRM 1R reed relays in tubular form with axial outlets from Tesla-VUT are suited, in addition to their application in UE 200 exchange line sets, for mounting on printed circuit plates as output elements of electronic circuits. To improve the reliability and service life of peripheral minature coaxial connectors, Tesla-VUT and Tesla in Jihlava developed connection technology for new VCEOY 75-2,6 and VBPAM 50-1,5 coaxial cables by depressing (contact resistance 1 mΩ).

Other new electronic components formed a part of the exposition of microwave technology, optoelectronics and communications technology.

Microwave Technology

Research and development of new components, circuits, systems and the requisite measuring technology for the millimeter region constitute one of the basic operations of Tesla-VUST, which at this year DNT introduced, among others:

--new types of microwave semiconductor components, particularly Gunn's VCG 241 and 242 diodes with 0.3 W power output for frequencies 8.2 through 12.4 GHz, two types of PIN diodes for limiters (VBI 600) and switches (VBI 605) in microwave integrated circuits and MIS condensors suitable for both blocking and adapting condensors in hybrid microwave integrated circuits up to 18 GHz (capacity 0.1 to 100 and 300 pF);

--reciprocal microwave circuits for lower frequency bands, i.e., microband circulators for the 4 to 8 GHz band, microband octave circulator for the 2 to 4 GHz band and a miniaturized circulator of the triplate type for the 1.3 to 2 GHz band.

Demonstrations of microwave measuring technology were prepared by the Institute for Radio Engineering of Tesla Pardubice. They included fixed coaxial attenuators, coaxial directional couplers, coaxial reversing switches, cavity wavemeters with direct readout and wideband coaxial wavemeters. In addition, the institute exhibited precision castings from aluminum alloys designed for application as parts of long-distance waveguides and as replacements for conventional technology, as well as coiled waveguides for dilatation, installation or interconnection of long-distance lines in a temperature range of -40 to +80°C.

The same institute (UVR) developed for reception technology in microwave bands the following devices:

--VBS 718 Tesla-VUST wide-band mixer with four integrated diodes made by conventional technology;

--wide-band mixer with image frequency suppression for frequency conversion from the 2.3 to 3.6 GHz band to 30 ± 3 MHz;

--microwave power amplifier with MESFE VCM 709 and 710 transistors (band 2 to 3.2 GHz, gain 30 dB, maximum power output 2 W);

--low-noise narrow-band amplifier for the 10 cm band with Tesla-VUST VCM 700 transistors (noise 4.4 dB and gain 19 dB at 3 GHz).

Optoelectronics

Particular attention of the panels of experts as well as of the visitors was focused on optoelectronic exhibits, which confirmed the increasing significance and effectiveness of joint cooperation among basic and applied research centers in developing this viable sphere of electronics.

New components for optoelectronics were introduced by URE CSAV:

--a Burrus-type frontal-emission communication luminescent diode prepared by diffusion technology on GaAs substrates (wavelength 920 nm, optical linked output 15 μW at 100 mA, transmitted frequency band 0 to 50 MHz);

--emission and detection elements for the 1.2 to 1.3 μm band on GaInAsP/InP basis in two variants, i.e., as basic frontally emitting structures with an upper and lower contact point, and an improved variant with mesa structure and both contacts from its lower side (optical effective radiated power maximum 2.5 or 8 mW at 50 mA);

--hybrid integrated circuits for transmission and reception modules of an optical link developed in cooperation with Tesla-VUST.

A result of cooperation between CVUT's School of Electrotechnical Engineering and Tesla-VUST, awarded a honorary citation by a panel of experts, is a simple hybrid circuit with a laser diode designed for the transmission of a pulse-modulated signal which makes it possible to connect any random light-conducting

fiber and is suited for systems requiring a high optical output (1 mW). It won the award along with two other exhibits from Tesla-VUST--a fast luminescent diode with connector for a hybrid version of a transmission module (optical output 60 to 100 μW, wavelength 0.81 μm, rise time 10 ns) and a connecting module for optoelectronic transmission systems with connectors (maximum attenuation 2 dB).

Two samples of optoelectronic transmission systems were introduced by VUSE Bechovice, namely a system with frequency modulation and a system with pulse-width modulation which will find application primarily wherever there is a need for providing high resistance in the transmission of analog signals against ambient electromagnetic interference and perfect insulation between points of measurement and the point of data processing.

The LOPOR device for locating breakdowns in light-conducting cables, exhibited by MPS, is based on the principle of time measurement between a transmitted pulse and its return transmission from the point of breakdown, and is the first instrument of its kind in CEMA countries. It measures up to a distance of 1 or 10 km with a measurement precision of 1 or 10 m.

Communications Technology

Exhibits of telecommunications technology were prepared by organizations of the Prague concern Tesla-Investment Electronics, primarily by Tesla-VUT. From among the many exhibited systems let us mention, e.g., the MPK 32 multiplex based on domestically produced parts which facilitates simultaneous transmission of 30 audio channels, the ADM coder/decoder with syllabic companding in connection with an optical line, the KPS 128-MX_2 digital multiplex of second order, the digital tract feeder (for two-way repeaters of the KPK 128 system), the first order 00 1 line repeater for MPK 32 systems, DT2 digital tract for the KPK 128 system and, last but not least, a set of measuring instruments for measurements on transmission systems using first and second order PCM developed in cooperation with the GDR, a modular set for length measurement and signalization in the region of controlling power engineering systems with DMS I busbar arrangement and an experimental sample of the electric part of systems for control of the transmission properties of telephone sets and their components by controlling transmission on several frequencies with a programmable cycle based on the TEST ELA 8080 microprocessor. A pedestal-type structure with built-in frameworks and connector frames for P85 transmission systems was exhibited by Tesla Strasnice.

Two exhibits were prepared by Tesla-VUST:

--a developmental two-band MDR 82 radio station conceptually readied for 160 and 450 MHz (transmitter output 12 to 15 W, receiver sensitivity 0.6 μV and a 12 dB SINAD);

--wide-band intermediate frequency filter with corrected phase response which forms a part of a receiver of the satellite system for transmission of broadcast and television signals (mf 70 MHz).

The WQZ 019 hybrid wide-band hf amplifier for the 10 to 240 MHz band (maximum ripple effect 0.5 dB, minimum amplification 18 dB) was developed by UVR of Tesla Pardubice.

Vacuum Technology

Figure 1 shows the secondary ions mass spectrometer (SIMS) of the concern enterprise Tesla-Vacuum Technology that received another honorary citation from the panel at this year's DNT. It is designed for surface analysis of solid substances, study of surface reactions, analysis of thin layers and isotope analysis in nuclear technology, mineralogy and geology.

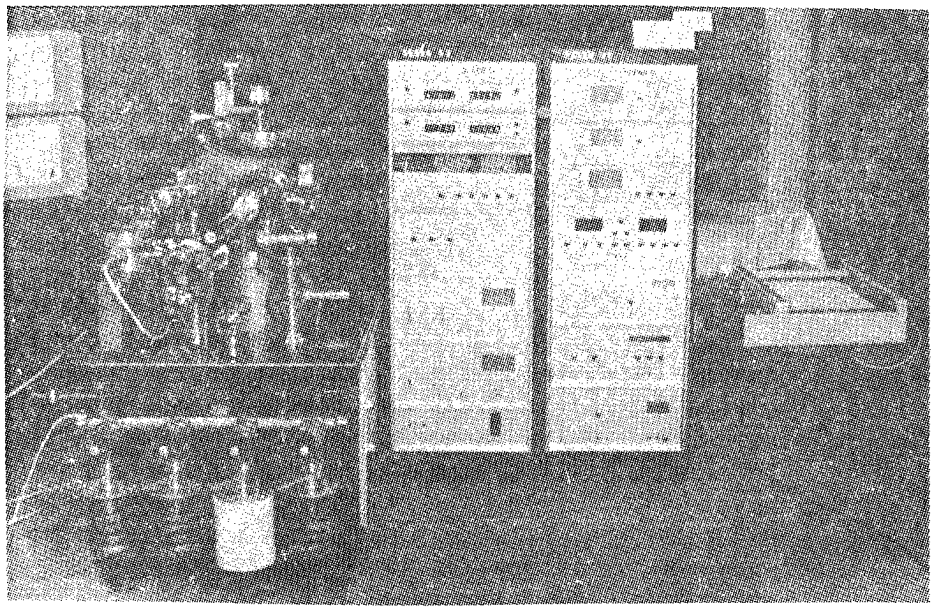

Figure 1. Mass spectrometer for secondary ions

From among the remaining exhibits of this enterprise, attention was attracted primarily by:

--QHA 100 quadrupole mass spectrometer for gas analysis in high vacuum (sensitivity 10^{-6}A/Pa);

--01 PG 54 channel-type electron multiplier with limited demand on space (amplification at a voltage of 3 kV on the order of 10^6 to 10^8, maximum noise pulse density 1 p/s);

--TKG 209 He-Ne laser of nonexplosive design for mobile short-term stake-out measurements and geodetic control operations in mines (minimum output 0.5 mW, power input 12 to 15 V, weight 9 kg).

Consumer Electronics

Samples of the latest products of consumer electronics have traditionally attracted, by their high level of technical design and the attained key features, the interest of the widest strata of the public. This applies primarily to the portable color television set from Tesla-VUST with the Soviet 32 LK 2C in-line picture tube, a MOSFET channel selector (sensitivity better than 100 μV, signal-to-noise ratio 22 dB) and a 45 W power input, which won an honorary citation from the panel of judges (Figure 2), the NAD 5120 record player (signal-to-noise ratio minimally 40 dB DINA, variation less than 0.15 percent) and stereophonic hi-fi 2x50 and 2x35 W amplifiers of the first quality class, also developed in Tesla-VUST.

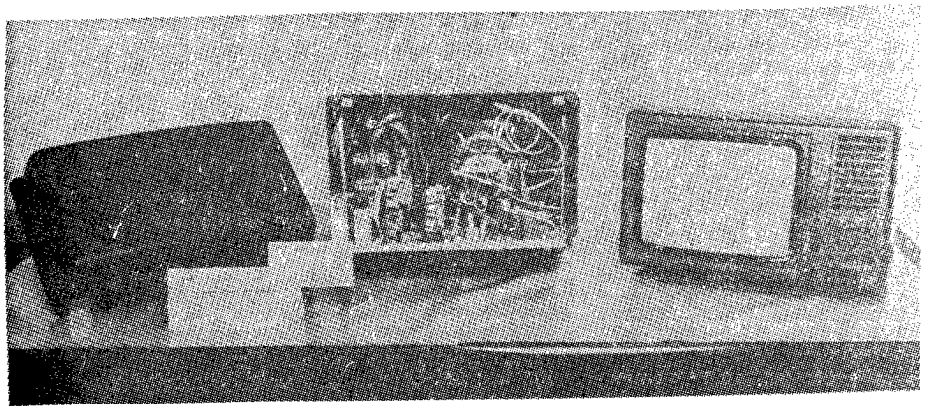

Figure 2. Portable color television set

From among the remaining exhibits of consumer electronics let us mention:

--COLOR 110-ST TESLA 4415 A television receiver (Tesla Orava);

--K 204-SAFIR stereophonic radio/tape recorder (Tesla Pardubice);

--M 710 A stereophonic casette tape-deck with luminescent diode level indication (Tesla Prelouc);

--compact broadcast receiver containing the T 710 A tuner, Z 710 A amplifier 2x10 W and the 1 PF 067 76 speaker system (Tesla Bratislava);

--M 400 central motor for direct drive of record player turntable with contactless commutation (Tesla Litovel);

--ADM 470 two-band electrodynamic moving-coil microphone set with cardioid directional characteristic and a frequency characteristic correction switch (Tesla Valasske Mezirici);

--ARN 4704 woofer for television receivers (45 to 13,000 Hz, maximum power input 10 W (Tesla Valasske Mizirici);

--ARO 9315 special loudspeaker with a high acoustic output (50 or 100 W) for musical instruments and sound reproduction in large concert halls (Tesla Valasske Mezirici);

--ARS 5115 module of a loudspeaker stand for intra- and extramural sound reproduction systems (150 to 8,000 Hz, 30 W).

The concern enterprise Chronotechna from Sternberk also introduced its new products:

--a series of electronic clocks with a unified clockwork (accuracy $\pm$ 30s/ 30 days, power input 300 µA, power feed 1.5 V);

--SPH-Q series of switching clocks used in control of storage appliances, heating and air-conditioning systems and control of technological processes, including economization of energy consumption.

Medical Electronics

A very significant area of applications of electronics in medicine was represented at this year's exposition by samples of instruments and devices developed and produced by Tesla Valasske Mezirici. In addition to the LSK 300 type VVI implantable cardiostimulator and the AZD 435/440/ intercom system for 60 participants in medical bed facilities, the public had an opportunity to familiarize itself also with several diagnostic and monitoring systems, particularly the following:

--OPX 617 A central monitor, specialized oscilloscope for EKG memory readout, cardiac rhythm analysis with histogram readout and alphanumeric representation of quasistatic values taken over from bedside monitors;

--LKM 215 cardiac monitor, a specialized bedside monitor for EKG and respiration monitoring and memory readout, analysis and readout of pulse and respiration frequency and sounding alarm in limiting states;

--LDF 280 cardiograph, an instrument continuously recording the pulse frequency of the fetus and the maternal uterus activity (Figure 3);

--LSN 330 central nervous system stimulator, a set of instruments affecting localized sections of the brain by means of pulses transmitted from an external part to an implantable part by radio frequency and for treating impaired psychic or motoric functions of the organism;

--LUV 450 blood-circulation meter by an ultrasonic Doppler-type directionally discriminating instrument for measuring vascular circulation in a range of 50 and 100 cm/s.

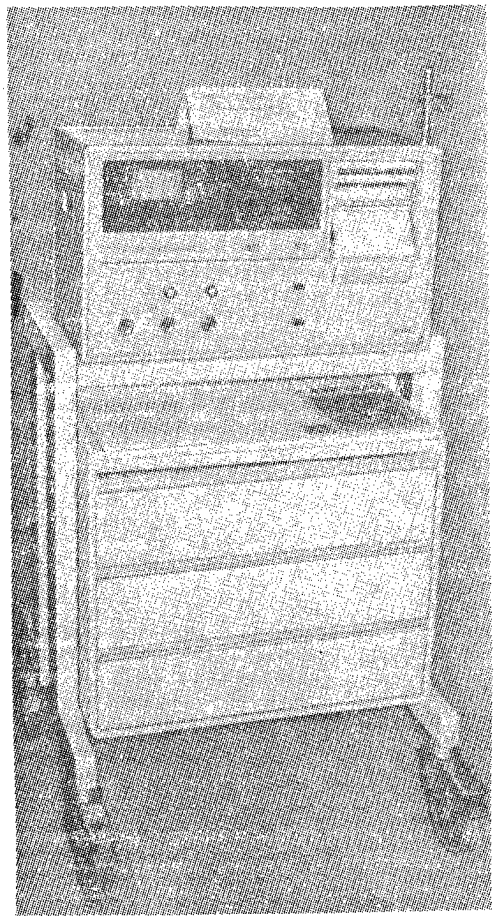

Figure 3. LDF 280 Cardiograph

Digital Technology and Automation

A digital memory for recording of television video signals and readout of this information with conversion to analog form in real time was demonstrated at the exposition by personnel of Tesla-VUST.

The SAPI I microprocessor system, developed and exhibited by Tesla Elstroj, is the smallest member of the SAPI [System for Automated Acquisition of Information] family of systems and processors for the acquisition and processing of information based on the JPR 1 microcomputer. Another exhibit, an operational semiconductor memory for the SAPI 80 system with a capacity of 65,536 8-bit words, is contained on a single printed circuit plate using MHB 4116 circuits, operating with the MULTIBUS busbar, developed by Tesla Strasnice.

The Research Institute for Mathematical Machines (VUMS) was represented at this year's DNT by a specialized work center for automation of design on the basis of a SMEP [System of Small Electronic Computers] minicomputer,

or an ADT 4500 and a CONSUL 2112-EC 8576 portable desk-top communication terminal formed by an alphanumeric keyboard and a point printer, suitable for applications calling for printout of documentation. Tesla Pardubice familiarized the visitors with a general program for the sorting of data (SORTF) for computers equipped with the FORTRAN IV compiler expanded through the form of an improvement suggestion.

This year's DNT of electronic research also introduced many examples of automation of operations, showing how they keep finding application in all walks of life and how the process of electronization of the national economy is progressing. Among the most interesting applications can be mentioned at least:

--SMEP TEXT 01 office-type microcomputer for automation of administrative operations (VUVT Zilina);

--a system for mass urban transportation control using the DRAHUSA computer (datasystem Bratislava and Tesla-VUST);

--an automated hydrometeorological station forming a part of a cybernetic information system for water management and ecology (SHU);

--automatic tuning of torsion resonators of electromechanical filters (Tesla Strasnice, Figure 4);

--an automated electronic string braining machine of a new concept with considerably improved performance (VUSE Bechovice);

--MDS-8055 D microcomputer for development of Interkosmos satellite instrumentation (Tesla-VUST);

--an automated system for testing plates with printed circuits KY 0 302 000 in the production of telephone sets of the second generation (Tesla-VUT);

--a furnace temperature controller with a microcomputer central unit (VUSE Bechovice, Figure 5);

--TELEMET AUTOMATIK, a system for measuring small dimensions (range 0 to 50, or 100, or 250 μm with a precision of 0.1 μm) in all areas of technical microscopy (Tesla Piestany);

--a measuring and programming system for identification of properties of MOS transistors (Tesla-VUST);

--the CAMAG system, a multichannel spectrometer set for measuring and analyzing energy spectra of radioactive radiation (Tesla-VUPJT Premysleni);

and, finally, two exhibits awarded a honorary citation by the panel of experts:

--ANS 1 automated low-frequency measuring system from Tesla-VUT (Figure 6) for measuring television, broadcast and communication operations in both monophonic and stereophonic circuits;

--CI 100 counting integrator from Tesla-Measuring and Laboratory Instrumentation (Figure 7) for analysis of chromatograms on the principle of numeric filtration and analysis of signal integration.

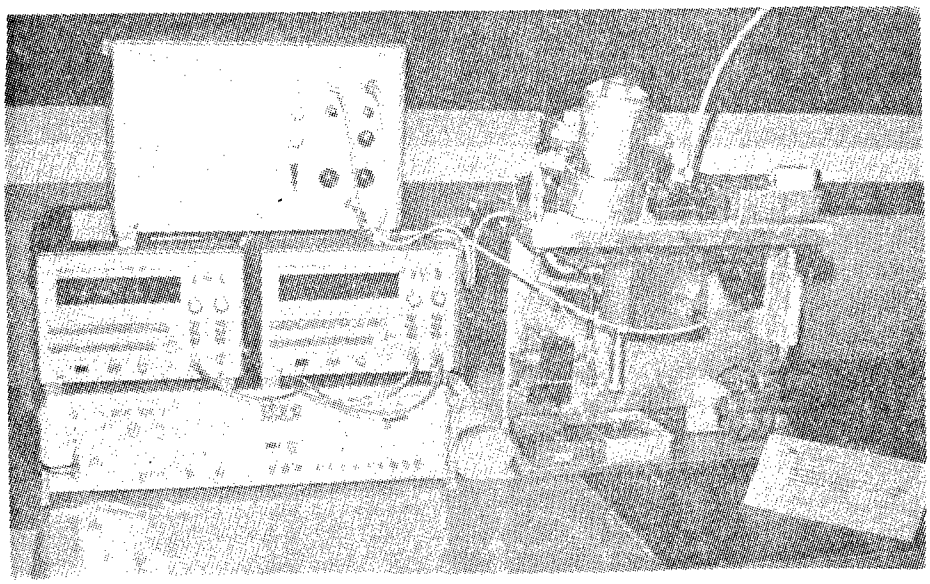

Figure 4. Automated center for tuning resonators of electromechanical filters

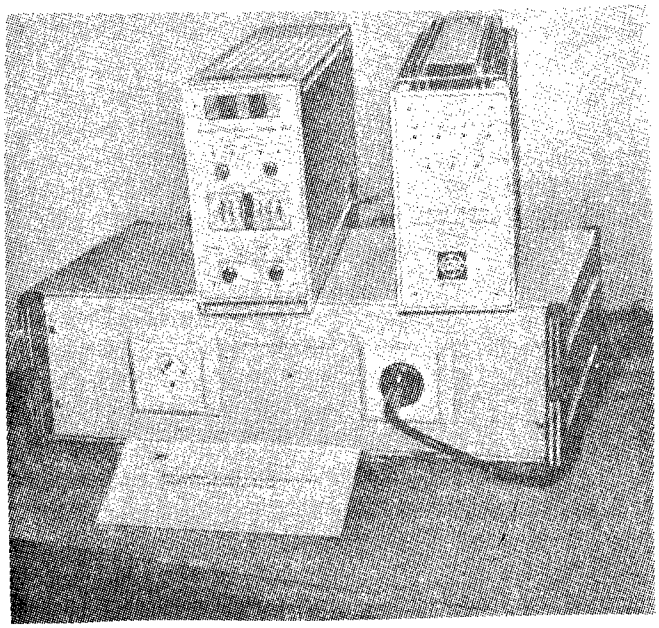

Figure 5. Temperature controller with a microcomputer

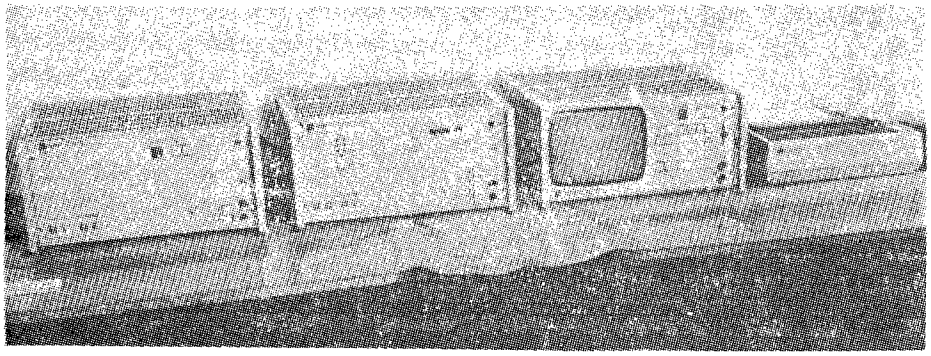

Figure 6. ANS 1 automatic low-frequency measuring set

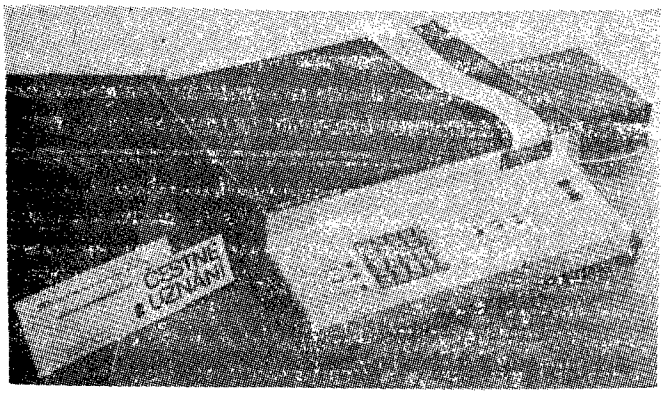

Figure 7. CI 100 counting integrator

Metrological and Laboratory Technology

The complexity and high demands of R&D operations as well as electronic production itself and the maintenance of electronic systems creates constantly increasing pressure on the technical level and quality of measuring techniques as well as on the technology of measurements and testing itself. An effort to meet these needs was demonstrated at this year's DNT, in addition to the already-mentioned systems and equipment, by many other exhibits. They aroused the justified interest of not only the technical public, but also of both panels of experts that awarded honorary citations to the following systems:

--Vibromicro vibration magnetometer (GFU CSAV) designed for measuring magnetization characteristics in the sensitivity range from paramagnetic and diamagnetic substances to ferromagnetica;

--a laser meter for measuring velocity and length (UPT CSAV) of solid bodies, particularly hot rolling stock in rolling mills and, in general, for measuring on soft, hot, or easily damaged surfaces (Figure 8);

--the DIAMETER system from URE CSAV for continuous contactless measuring of the diameter of optical fibers or of precision wires during their drawing or wear (range 50 to 500 μm, precision 1 μm, analog and digital indication);

--a supraconductive quantum magnetometer (UMMT SAV) designed for identification of magnetic activity in live organisms (Figure 9);

--Tesla-VUST logic analyzer (Figure 10), a diagnostic system for acquisition and imaging of digital information represented by input signals taken by input probes;

--pulse-regulated power supply sources 5 V/10 A with MOSFET output elements together with pulse-controlled sources of the DS series from VUMS and ZPA Kosire for application in computer, metrological and automation technology (Figure 11).

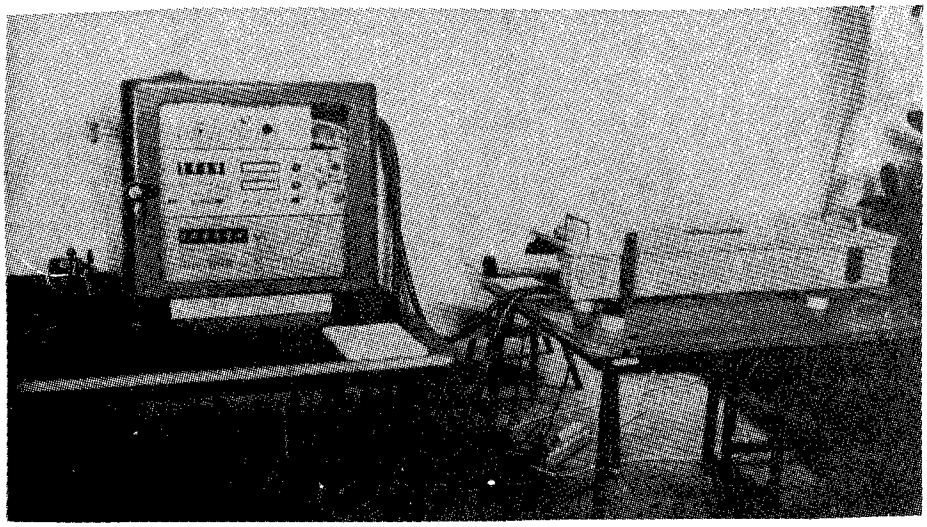

Figure 8. Laser meter for measuring velocity and length

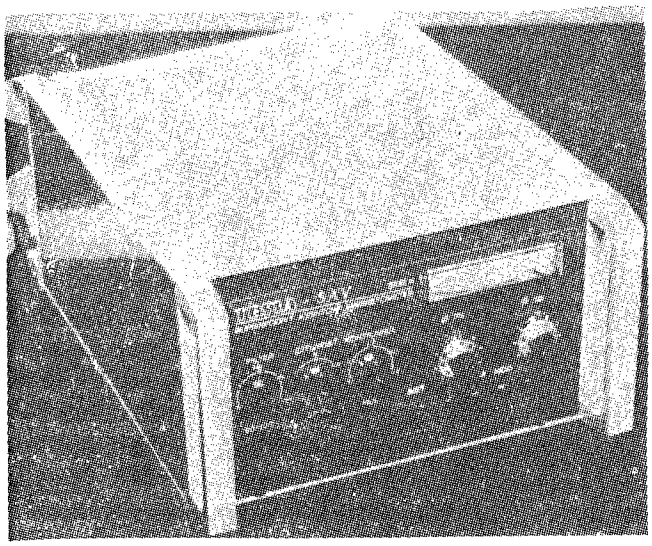

Figure 9. Supraconductive quantum magnetometer

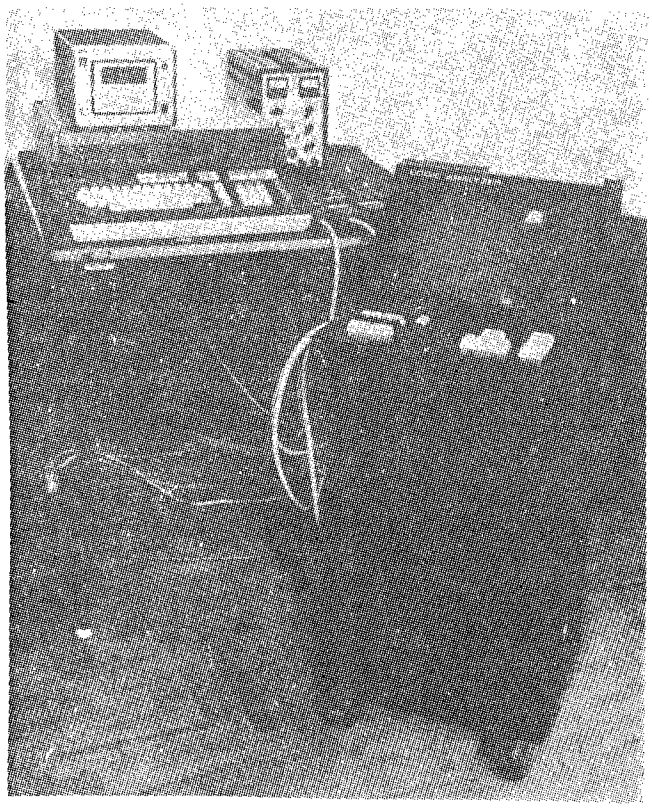

Figure 10. Logic analyzer

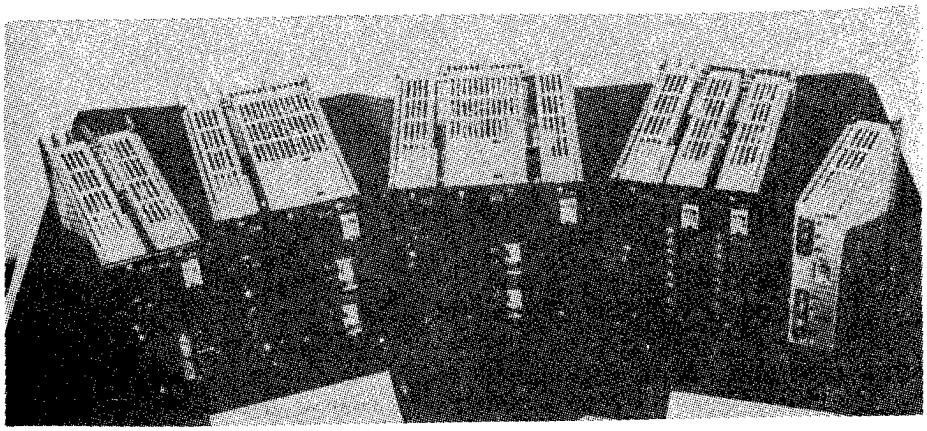

Figure 11. Pulse-regulated power supply sources

A wide application in the production process of machine building workshops will be found by a laser interference measuring system facilitating precise, easy and expedient measuring of lengths (0 to 50 m) feed velocities (0-300 mm/s), small angles (0-0.1 rad), straightness (0-20 m) and small deformations (0-2 or 20 μm) which was developed, just as the next exhibit--monocrystallic scintillators for scanning electron microscopy--by UPT CSAV in Brno.

EU SAC introduced a silicon barrier detector of corpuscular radiation sensitive to position. A system for testing the service life of semiconductor lasers was exhibited by URE CSAV. The ANAK 900 differential analyzer, developed by personnel of UJF CSAV (Figure 12), serves for the analysis and sorting of visual perceptions. The CVUT School of Electrotechnical Engineering was represented, among others, by a module for measuring weak currents in a range of $\pm$ 1.25 to $\pm$ 320 μA for the TSA-01 tester.

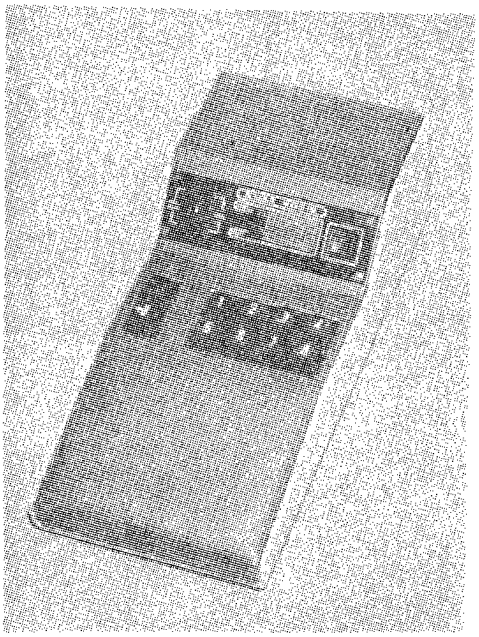

Figure 12. ANAK 900 differential analyzer

Tesla Brno presented samples of its production program:

--BM 578 symptomatic analyzer, a servicing instrument for testing and fault finding in complex sequential logic networks;

--BM 579 millivoltmeter (a.c. voltage 100 μV to 300 V, 10 Hz to 15 MHz);

--BM 591 automatic meter for expedient measurement of the properties of circuit elements RLCG (precision 0.25 percent, power input 35 VA, 220 V, 5 kg).

The Laboratory Instruments enterprise is the producer of yet other exhibits--a system for electrochemistry (PA3 polarographic analyzer, SMDE static dropping electrode, XY 4105 planar coordinate recorder) and the RIDK 101 refractometer for chromatographic analysis.

From the creative workshops of Tesla-VUT originates an instrument for measuring reflections of relay contacts and a thermostat for verification of the thermal dependence of electronic components in a range of -30 to +60°C. The exhibited system for measuring the electrical properties of disk heads for VDP 100 large-capacity disk memories was developed by VUMS.

Tesla-VUST developed for R&D purposes a measuring set for the analysis of deep centers in semiconductors. As more prominent examples of metrological technology can be mentioned a contactless meter of transverse dimensions up to 20 mm (VUSE), a digital voltmeter with MIT 330 microprocessor (Metra Blansko), intermediate frequency control generator for radiolocation systems (Tesla Pardubice) and a transistorized alternator for frequency control of asynchronous motors up to 3 kW (VUSE).

From among systems for laboratory and technological purposes let us mention:

--SMM-1 condenser welding machine for welding thin metal plates in electro-technical production (Metra Blansko);

--ultrasonic cleaner of 1-liter capacity for stomatology, optics, imitation jewelry, etc. (VUMA Nove Mesto on the Vah River);

--UZK-3 ultrasonic contacting system for semiautomatic welding of semiconductor systems by a thin gold wire of 25 to 50 μm (Tesla-VUST);

--fittings for the distribution of high-purity and aggressive gases in technological installations (Tesla Elstroj).

Instrumentation for Nuclear Engineering

A specialized part of the exposition was prepared by Tesla VUPJT. It included, among other exhibits, a dosage meter and dosage absorption from natural and artificial sources of ionizing radiation NB 9201, a NE 3502 A detection unit for measuring of samples with radionuclides emitting gamma radiation, the NE 3503 detection unit for measuring waste waters from nuclear power

plants and from uranium mines, several scintillation detectors of ionizing radiation that meets the highest world standards for many applications in research as well as in industry and,a large-scale proportional flow-through counter POR 102 for detection units of meters measuring contamination of hands and clothing, the NA 6202 and 6203.

Svazarm Exposition

Also premiering at this year's DNT were several enterprises and organizations of Svazarm which not only added variety to the exposition's thematic contents but provided proof of the high technical level of their activities in the sphere of electronics. This was also recognized by the panel of experts, which awarded a honorary citation to the part of the exposition that contained a stabilized power supply source SZ3.81 0 to 30 V/10 mA to 1 A, the HG1.81 low-frequency generator 0.9 Hz to 110 kHz, a low-frequency millivoltmeter for 80 m band and the N-RPZ 021/L charger of NiCd 450 mAh type storage batteries, developed by the Svazarm AERON enterprise (Figure 13).

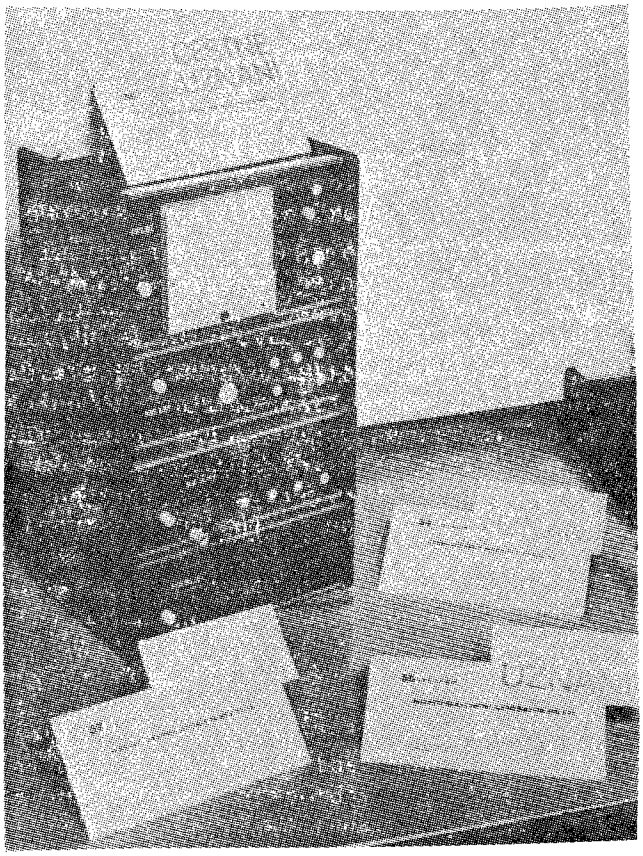

Figure 13. Set of measuring instruments from Svazarm

From among other Svazarm exhibits, interest was generated by the R 27-1 radio station with a range of up to 4 km, the ROB 80 radio direction finder/receiver, transceiver of the RPZ-021 radio-control system, an integrated circuits tester, frequency meter for 0 to 100 MHz, a coupled charging source for storage batteries, a short-wave RX3 receiver for amateur bands, the LABE transceiver, an all-purpose instrument housing, the AKUTEST battery voltage indicator, the PIP-4 programmable instructional computer, the DS 200 modular system, the TW 44 Junior stereophonic amplifier, the MODELA 4 AM 27 for 4 and 6-functional remote control of model aircraft and a work station for a judge in the evaluation of parachute aerobatics which already found application in the 1982 World Parachute Championships.

Specialized Seminars

The DNT of electronic research are not only an exposition, but also an opportunity to obtain additional detailed information about exhibits and other projects of exhibitors as part of the traditional 3-day specialized seminar at which the following presentations took place in several sections this year:

Telecommunications technology: A new concept of control in the production of telephone sets. A digital communication field for telephone exchanges. The AZS II testing system for production tests of telephone exchange subsets. Hierarchical structure of digital transmission systems in CEMA countries. The KPK 128 digital transmission system of the second order. Utilization of microprocessors in electron measuring techniques. Filters in hybrid tantalum technology for telecommunications technology. Effects of the basic network on the determination of the optimum modular division of mechanical design and selection of connectors.

Electronic systems: Basic circuit design for portable color television sets. Digital processing of images. Acoustic and structural feedback in loudspeaker systems used with record players. The E 277 A graphic terminal. BM 583 logic analyzer and its application in diagnostics of microcomputer systems. DS type series of pulse-controlled sources. Methods for interference suppression in semiconductor systems. New approaches to control of digital autonomous servo-systems with stepping motors. Automated tuning of resonators of electromechanical filters. Design of phase-corrected filters by means of small computers. Problems attendant to design of octave circulators.

Semiconductors and optoelectronics: New integrated circuits being developed in Tesla-VUST. 8048 integrated microcomputer. New types of microwave semiconductor components. Emission and detection elements developed on the basis of dual GaInAsP/InP heterostructure. Service life of semiconductor lasers on the basis of GaAlAs/GaAs for optical communication systems. Optoelectronic transmission systems for measurements in high-voltage test facilities. Pinpointing of defects in optical cables. Developmental trends in the technology of light-conducting fibers.

Metrological technology: NV 3101 set for continued measurement of radionuclides. NB 9201 dosage and exposure meter. Temperature controller with a central microcomputer unit. BM 350 modular microprocessor system application in control of the IMS-2 measuring system. A module for measuring weak currents. Unconventional applications of microwave technology.

Laboratory and physical instrumentation: An automated system for the acquisition of hydrometeorological data by an automated station. Superconductive quantum magnetometer. Mass spectrometer for secondary ions. Contactless meter for transverse dimensions. Laser for measuring length velocity. Laser interference measuring systems and some of their applications. The Vibromicro vibration magnetometer.

BIBLIOGRAPHY

1. Catalogue of Exhibits at the DNT Exposition of Electronic Research '83, Tesla-VUST--ODIS VTEI FMEP [Scientific, Technological and Economic Information Center, Federal Ministry of Electrotechnical Engineering], Prague, 1983. Not paginated.

2. Monograph of lectures presented at the DNT Exposition of Electronic Research '83, Tesla-VUST--ODIS VTEI FMEP, Prague, 1983, 2 volumes.

Electronics Seminar Contributions Enumerated

Prague SLABOPROUDY OBZOR in Czech No 12, 1983 pp 611-612

[Article by Eng K. Hynek: "Statewide Seminar on Materials for Electronics--1983"]

[Text] On 9-11 March 1983 there took place in Tabor in the Hotel Palcat the first statewide seminar entitled "Materials for Electronics" organized by the CUV [Czech Central Council] of the Electrotechnical Society of the CSVTS [Czechoslovak Scientific and Technological Society], the key R&D center of materials for electronics Tesla-VUST [Research Institute for Communications Technology] of A. S. Popov, Tesla-Electronic Parts, the concern enterprise Tesla in Roznov at Radhost Mountain, the CUV of the CSVTS Society for Industrial Chemistry, the UOS [Central Group of Specialists] in materials for electronics and the CSVTS House of Technology in Ceske Budejovice.

The seminar's objectives were: to familiarize the participants with the material needs of individual Czechoslovak work centers and the state of meeting them in production organizations; inform them of the latest results of R&D and development of materials for electronics as well as of the results of negotiations regarding their implementation within the framework of international cooperation with socialist countries; specify in closer detail the directions of continued research and development with a view to the actual needs of Czechoslovak electronics; and prepare for engaging additional domestic R&D facilities to meet the bourgeoning needs of electronics in the interest of gradual cutbacks in dependence on imports on these materials from nonsocialist countries.

The key specialized topics of the seminar were: high-purity and special chemicals, metals, their alloys, semiconductors and composite materials, glass and ceramics, special types of plastics, gases and gaseous compounds, measuring and control methods for materials used in electronics.

The seminar presentations included 13 outline reports solicited by the organizers from selected specialists among the organs and organizations engaged in meeting the material demands of electronics (FMHTS [Federal Ministry of Metallurgy and Heavy Engineering], MP CSR [CSR Ministry of Industry], MP SSR [SSR Ministry of Industry], GR [General Management] of the Kovohute enterprise, VUHZ [Research Institute for Ferrous Metallurgy]) and from among organizations requiring such materials for production or research in electronics (FMEP [Federal Ministry of the Electrotechnical Industry], Tesla concern enterprise in Roznov, VUST, etc.).

The agenda included also 31 brief presentations and 31 panel contributions with graphic documentation.

A condensed version of the lectures and of panel annotations was published in a monograph which the participants received during registration. The monograph was published by the CSVTS House of Technology in Ceske Budejovice.

On its first day the seminar took the form of a plenary session. After an introductory address it opened with a lecture entitled "The Material-Intensive Factor in the Concept for Development of Czechoslovak Electronics" presented by Tesla-VUST manager Eng R. Sorm, CSc. Thereafter, Eng M. Samonil, CSc (FMEP Prague) spoke on the implementation of a viable material base by central organs. Eng I. Hejtmanek (Tesla Roznov) dealt with the requirements on high-purity chemicals for microelectronics. Eng J. Kukac (MP CSR Prague) dealt with the potential for meeting the requirements of electrotechnical engineering in the area of high-purity chemicals and gases for electronics. Eng J. Kratochvil (Tesla Roznov) specified the requirements on special metallic materials for electronics. The presentation by Docent Eng J. Tucek, CSc (Kovohute Rokycany), dealt with the possibilities for providing special metallic materials for electronics; Eng V. Vach (VUHZ Karlstejn) familiarized the participants with the situation in providing special steels for color television picture tubes; Eng J. Findejs (FMHTS Prague) spoke of providing metallurgical materials for electronics through cooperation with CEMA countries; Eng J. Smetana (FMEP Prague) reported on providing special materials for the production of color television picture tubes through mutual cooperation between the CSSR and the GDR. A brief presentation regarding the utilization of waste materials in electronic production facilities as a source of secondary raw materials was presented by Eng H. Simanova (Tesla-VUST Prague), and Eng M. Babinsky (ZSNP [Plants of the Slovak National Uprising] Zdiar on the Hron River) spoke on the problems currently encountered in the production of gallium arsenide monocrystals.

Due to the large number of registered active participants, the seminar was divided on the second day into two sections. Several interesting contributions were presented in the metals and semiconductors section. The material

problems of the concern enterprise Tesla Lanskroun were reported on by Eng L. Konicek. The presentation by Eng J. Kunes (VUK [Research Institute for Metals] Panenske Brezany) dealt with new CuFe-based alloys being developed for electronics; Eng R. Splitek, CSc (VUK Panenske Brezany) provided information about research and preparation of high-purity metals for electronics; Eng V. Toman (Safina Jesenica) reported on bimetallic materials containing precious metals and their applications in electronics; Eng K. Vurm (Kovohute Pribram) dealt with soft solder and low-fusing alloys; Eng O. Kotoun (Tesla Jihlava) spoke of materials for structural components. Dr Nat Sci K. Tomek, CSc (Tesla-VUST Prague) presented a report on the outlooks of semiconductor materials $A^{III}B^{V}$; Docent Dr H. Frank, DrSC (CVUT FJFI [Czech Institute of Technology, School of Nuclear and Physical Engineering] Prague), mentioned the results and experience gained in neutron alloying of silicon; F. Deml (Tesla-VUST Prague) dealt with pure materials for epitaxial gallium arsenide technology; Dr Nat Sci J. Stejskal, CSc (Tesla-VUST Prague), described preparation of epitaxial structures of $A^{III}B^{V}$ substances with the aid of organometallic compounds; Eng A. Stehlik (Tesla Roznov) devoted his contribution to unconventional applications of semiconductor materials; Eng S. Baratka (Chair of Electrotechnology, College of Mechanical and Textile Engineering, Bratislava), spoke of the demands on materials for laminar solar cells. Eng V. Laichter (Tesla-VUST Prague) cited experience with the use of scanning electron microscopy (SEM) in the examination of materials for electronics; Dr Nat Sci M. Cukr, CSc (Tesla-VUST Prague), familiarized the participants with the potential uses of chemical diagnostics in semiconductor technology.

The following materials and brief presentations were introduced in the section of chemical materials: Eng J. Gurovic, CSc (Tesla-VUST Prague) reported on gases and gaseous mixtures from the viewpoint of their applications in semiconductor technology; Dr Nat Sci C. Jech, (UFCHE [Institute of Physical Chemistry and Electrochemistry] Prague), reported on gaseous media for reactive plasma and ion etching. The report of Eng P. Tesarik (Lachema Bohumin) on gases and gaseous mixtures dealt with the possibilities and outlooks for meeting the demands of electronics; Eng M. Knizek (Tesla-VUST Prague) lectured on problems attendant to reagents used in the production of LSI and VLSI circuits and about the applicable qualitative demands in such uses. Eng B. Rous (Tesla Roznov) spoke on the demands made on the quality of high-purity water for the production of electronic components; Eng A. Mistr, CSc (Lachema VUCCH [Research Institute for Pure Chemicals] Brno), pointed out in his lecture on "Light-Sensitive Solutions for Micro-Electronics" the situation in research and production in this sphere. Eng V. Bednar (VSCHT [Institute of Chemical Technology] Prague) spoke about new types of resistors for the production of LSI and VLSI circuits. Eng V. Blechova (Tesla-VUST Prague) provided information about the current and prospective uses of plastics in electronics; Eng K. Lidarik, CSc (VUSPL [Research Institute for Synthetic Resins and Varnishes] Pardubice), devoted his contribution to epoxides for electronics; and Eng J. Makovicka (CKD Polovodice Prague), spoke about the increasing importance of application of plastics for encasing of high-efficiency semiconductors.

On the third day the seminar was conducted in the form of a plenary session. The presented contributions were oriented toward applications of ceramics and glass in electronics. Eng M. Kynkor (VUEK Hradec Kralove) presented a lecture entitled "Ceramics for Electronics" in which he provided information about long-term development in this sphere. Eng B. Rous (Tesla Roznov) enumerated the requirements on special glasses for electronics; Eng M. Riedel presented on behalf of Eng V. Khol (Sklounion Teplice) a lecture on the possibilities for providing glasses and vitreous substances for electronics. Docent Eng Brozek, CSc (VSCHT Prague), oriented his contribution toward special SiC for electrotechnical engineering. Eng J. Hanykyr, Dr Sc (VSCHT Prague), reported on deformations of corundum ceramics. Docent Dr Nat Sci R. Kuzel, CSc (School of Mathematics and Physics, Charles University, Prague), dealt with potential applications of insulated steel substances for hybrid microelectronic systems; Eng J. Broukal, CSc (SVUS [State Glass Research Institute] Hradec Kralove), spoke on key applications of special glasses and vitreous crystalline substances. Eng P. Chraska, Dr Sc (UFM CSAV [Institute of Physical Metallurgy, Czechoslovak Academy of Sciences] Prague), mentioned experiences with applications of piezo-ceramics for exchangers of electromechanical filters. Eng P. Strnad, CSc (VUSU Sklounion Prague), reported on vitreous crystalline materials and their applications in electronics.

The seminar was participated in by 230 specialists, 29 representing central authorities, 30 from institutions of higher learning, 20 from CSAV institutes, 78 from research institutes and 73 from production enterprises.

The wide participation by material specialists throughout the 3 days of the seminar, the satisfactory quality of most presentations and the very lively discussion stand as proof of the complexity and demanding nature of providing of materials for electronics and of how great the attention devoted to this problem is. After the lectures on the first and second day, panel contributions with the personal participation of the authors were held. Abstracts of these contributions are included in the monograph. The seminar participants took great interest in the panels and consultation with their authors, as shown by to-the-point and useful discussions and the almost overcrowded hall where the panels were held for 2 days.

The authors presented the following topics in panels: Docent Eng V. Brozek, CSc (VSCHT Prague): effects of ionizing radiation on electrotechnical materials; Eng L. Moc (Tesla-VUST Prague): requirements on powdered zinc for anode substance of alkalic manganese dioxide cells; Eng L. Pekarek (Tesla-VUST Prague) spoke about the preparation of polished plates made of indium phosphide; Eng P. Tuma (Tesla-VUST Prague) submitted the results of photoelastometric assessment of $LiTaO_3$ monocrystals. Eng A. Franek (VSCHT Prague) familiarized the participants with problems of the mechanism of processes affecting the service life of soft solder in machine soldering; Eng V. Skocil (VSEE [Institute of Mechanical and Electrotechnical Engineering] Pilzen) described the relationships encountered in determining the properties of materials by correlative methods; Dr Nat Sci I. Ohlidal (Chair of Solid Phase Physics, School of Natural Sciences, UJEP [University of Jan Evangelista Purkyne] Brno) reported on a new method for determining the optical properties

of polycrystalline silicon. Eng P. Romaniak (VUK Panenske Brezany) presented a panel on AlSi 12 foil for production of semiconductor power elements; Eng M. Janu (UVVVR [Institute for Research, Production and Application of Radioisotopes] Prague) introduced the preparation of low-doped silicon with homogeneously distributed doping agent and a method for generating doping elements in silicon through activation by slow and fast neutrons. Eng J. Kriva (Tesla Strasnice) presented a new hardenable alloy for mechanical resonators of electromechanical filters. P. Benes, graduate physicist (Tesla-VUST Prague), presented the results of the effects of chromium contents in a semi-isolated gallium arsenide assessed by absorption in the infrared region of the spectrum and optical current spectroscopy. Eng J. Javorsky (VUKI [Research Institute for Cables and Insulators] Bratislava) described new methods and devices for the examination of materials for printed circuits; Eng V. Klabik, CSc (SVUM [State Research Institute for Materials] Prague), presented a panel on the results of development and production of supraconductive NbTi conductors in SVUM Prague. Eng J. Devaty (VSCHT Prague) introduced the preparation and properties of selected polymers suitable for negative and positive electron resistors. Docent Dr Nat Sci Kuzel (School of Mathematics and Physics, Charles University Prague) presented information about electric circuits on insulated steel substrates and about inexpensive resistance pastes for thick-layered resistors. Dr Nat Sci A. Franek (SLS VSCHT and CSAV Prague) outlined some latest methods for the production and application of Al_2O_3-metal cermets in electrotechnical engineering. Eng B. Perner, CSc (Monokrystaly Turnov), described the preparation of high-purity (5N) Al_2O_3 and control of its purity by the luminescence method. Eng J. Bartova (Tesla-VUST) prepared a panel on thermally conductive adhesives on the basis of epoxy resins with metallic and nonmetallic fillers. Eng J. Danhel (Tesla Pardubice) described the effects of contamination of freon TF and ledon 113 on the corrosion of galvanic coatings. Eng K. Nejezchled, CSc (VUEK [Research Institute for Electrotechnical Ceramics] Hradec Kralove), held a panel entitled "Ceramics--An Always Topical Material in Electronics," and Eng M. Boudys, CSc, from the same institute, a panel entitled "PZT Ceramics--A Viable Material for Pyroelectric, Optoelectric and Thermo-electric Applications." He introduced new technologies of their preparation --pressure sintering and formation of thin foils by casting. Dr Nat Sci P. Schneider (Tesla-Vacuum Technology Prague) described the principle of preparation and the mechanism of formation of pyrolytic carbon layers, their properties and applications. Eng P. Masek (VUEK Hradec Kralove) familiarized interested participants with the method for nonelectric deposition of general metal coatings on ceramics. Dr Nat Sci A. Kubovy, from the same institute, presented an outline of the preparation of conductive preparations for thick-layered hybrid integrated circuits. Eng J. Sramek, CSc (Tesla-VUST Prague), prepared a panel about prospective ferritic materials for microwave technology. Eng I. Fanderlik, CSc (SVUS Hradec Kralove), provided information about a new type of glass for apertures of casings of reprogrammable memories. Eng A. Galikova, CSc (Tesla-VUST Prague), introduced a panel about epoxy substances for embedding luminous elements, and Eng M. Kovacikova (VUKI Bratislava) prepared a panel on materials for multilayer printed circuits and on the assessment of the flammability of laminated insulators.

In one of the adjacent halls there took place a small exposition of materials and products turned out by enterprises or institutes of the seminar's participants, which met with considerable interest. It included 19 exhibits from 13 organizations, 2 of them institutions of higher learning, 5 research institutes and 6 production enterprises. Great attention was given to a disassembled color television picture tube and its structural elements, the latest type of light-conducting fibers, optical fibers and precast elements made of domestic raw materials by the Quartz Silice company, new types of materials made of nonferrous metals, metallurgical materials for color television picture tubes and others.

A survey was taken with the objective of respecting the opinions of the participants of this special presentation that was used to formulate conclusions and recommendations from this seminar.

The program, thematic contents and technoeconomical contribution were positively rated by an absolute majority of the participants, together with a recommendation to hold seminars with the same thematic contents every 2 to 3 years. The contributions provided in discussions and through the survey pointed out that in at least some selected spheres there is a need for accelerated establishment of a logistic base of quality in Czechoslovakia that could be used as an exchange equivalent in international negotiations.

Excellent organization contributed to the successful progress of the seminar.

VARS-Multilevel Automated Control System

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 pp 707-711

[Article by Zaboj Statecny, Office Machinery fiduciary concern organization: "VARS-Multilevel Automated Control System"]

[Text] The objective of devising the VARS applicational software is to offer to users of JSEP 2 [Uniform System of Electronic Computers] computer systems, primarily of Czechoslovak computers of the 3.5 generation EC 1025 and/or their innovated types EC 1026 and 1027, a tool which in the sphere of enterprise administration:

--will considerably reduce the demanding nature and cut down on the time needed for the implementation of ASR [Automated Control Systems];

--will facilitate the effective utilization of the wide scope of opportunities offered by the JSEP 2 computer systems in linkage to SMEP [System of Small Electronic Computers] and modern systems for data acquisition, preprocessing and distribution;

--will significantly contribute by its thematic orientation (integration of several management levels to the median level, orientation on key spheres of management) and its modern principle of implementation to meeting the key objectives of automation, which are improved effectiveness and lower administrative load in management.

The VARS system is dealt with as part of state project P 04-119-214. It is applicable in general to all computers of generation 3.5 working with the DOS-3 operational system. It is intended as an ASR for the managerial sphere of enterprises with the proviso that specific parts of VARS are modeled for machine-type production, and production with analogous structural and technological characteristics.

Thus, VARS is an applicational type of software. From this it follows that it handles algorithmable parts of ASR tasks and does not contain type solutions for a comprehensive concept of a control system. It represents software for ASR and can serve as a significant tool in the implementation of comprehensive ASR in many organizations, because it is based on an analysis of the thematic contents and developmental trends in the control system as a whole. It can also handle all requisite linkages to nonautomated parts of ASR.

Its design is based on the modern principle of modular structure and, to a considerable extent, uses methods of structured programming. It is backed up by relatively vast experience gained in the operation of the MARS type project, which was adopted by more than 200 enterprises and brought about demonstrably great savings for society as a whole.

The endeavor of the designers and the basic characteristic of devising the VARS system was an achievement of the requisite integrity for the entire system. This objective was attained through the following means:

1. The common denominator of the entire system became the Catalogue of Data Elements, which precisely describes and characterizes each data element used within the system.

2. The DBS-25 databank system, which forms the basis of the VARS system, is utilized by the VARS system to the maximum extent as its first large user ever.

3. Programming of the VARS system is based on the utilization of so-called type elements. A type element represents a functionally and algorithmically complete modifiable part of software capable of effective multiple use within the system or in its individual subsystems.

This provides a prerequisite for dealing with the contradiction between type solutions and specific requirements of individual enterprises.

4. Another unifying element is documentation turned out in accordance with predetermined principles and methodical instructions. It respects the principles of structured design and programming. The documentation part was already devised directly on a computer which in a significant manner makes the entire operation easier, particularly the updating of documentation.

5. The integrating factor is internal and external linkage, which make it possible to present VARS as a compact system.

With the aid of these means it became possible to devise a truly integrated system which has no parallel in the CEMA countries.

The VARS system covers all basic areas of enterprise activities. It consists of a total of nine subsystems, and an additional five subsystems are currently in development. The basic subsystems, the first stage of which has already passed national tests, are: Technological Preparation of Production (TPV), Operational Production Control (ORV), Material and Technical Logistics (MTZ), Labor and Wages (PAM), Economic Information (EKI), Marketing (ODB), Use of Equipment (NAR), Long-Term Production Assets (ZAP) and Technoeconomical Planning (TEP). The other 5 subsystems are QUALITY, ENERGY, TRANSPORTATION, COMPUTER CENTER CONTROL, TECHNOLOGICAL DEVELOPMENT.

The difference from MARS is constituted by the fact that the entire system was devised frontally, i.e., all basic subsystems simultaneously with all the requisite systemic linkages.

The advanced level of VARS design can be summarized as follows:

--database processing of information;

--key information linkages between subsystems are implemented through a central data bank;

--the programming of subsystems itself is relatively independent of the data base which the user can generate himself by using microinstructions of systems description according to his own need;

--software is independent of the means used for input/output, i.e., there exists a favorable prerequisite for an interactive method of operation.

Selected APV [Automation of Enterprise Management] for ASRSC [Automated Control System for the Median Level of Management]

Among VHJ's [economic production units] of the same organizational form, e.g., a concern, there exist relatively considerable differences with regard to the measure of centralization of decisionmaking or even implementational activities within their organizational arrangement, etc. Some activities, e.g., from the area of marketing, MTZ, personnel administration, technical development, management of long-term production assets, etc., will be performed--from the viewpoint of the enterprise's administrative sphere--alternatively either at the VHJ level, the enterprise level, or in fiduciary organizations.

Under these circumstances, for the needs of type-oriented applicational software it is not always possible to reach unequivocal decisions regarding each control activity (whether it belongs to management at the enterprise level or to the VHJ) and, for that reason, a provision must be made for both possibilities.

Selected type elements that can be used at the median level of management originated during the planning of VARS in the following manner:

--taking over type elements (TPK) from VARS subsystems that were being developed for ASRP [Automated System of Enterprise Management] with eventual modifications in analogous areas of ASRSC;

--taking over TPK from selected tasks of ASR of ministries having jurisdiction over the sector concerned;

--generating additional TPK for specific functions of the median level of management.

Consideration had to be given in the selection of TPK for ASRSC to the need for accelerated automation at the median level of management, because implementation of ASRSC showed some lag behind ASRP and ASR of sectoral ministries, a fact which considerably complicates integrated automated functioning at more levels of management.

With a view to these factors it was decided to deal in the initial phase with APV type elements for the following ASRSC tasks:

--a model for annual and medium-term planning in the basic proportion of the plan of production, marketing, logistics and operations expressed in kind and in value terms on the basis of consolidated standards and indicators for selected groups of products;

--a model of annual and medium-term planning of costs on the basis of planned and resultant calculations per production sector and assortment group;

--an analysis of the development of economic effectiveness of VHJ's using the methods of labor value added and incremental relations;

--an analysis of proposed annual and medium-term comprehensive plans of the VHJ from the viewpoint of economic effectiveness, using the methods of labor value added and incremental relations;

--recording, breakdown, review proceedings for the operational plan for production, marketing, MTZ, taking into consideration the sphere of obligatory and orientational plan indicators and facilitating expansion in accordance with the views of sectoral management;

--processing and analysis of statistical records in the area of production, MTZ and marketing;

--devising chronological sequences of planned and actual states for selected indicators;

--processing of fiscal balances and distribution of planned profits;

--schedule of payments, record of drawings on payments and the balance centrally, for the VHJ, for controlled funds;

--developmental series of indicators showing the profitability of exports, development of surcharges and rebates in relation to price development;

--recording, monitoring the development of planned prerequisites for the progress of construction projects and launching into operation of selected projects of capital construction.

Problems relating to shared data bases, or their parts, for ASRP and ASRSC, the manner of using these bases and their backup by technical means are dealt with simultaneously.

Devising of VARS Subsystems

1. Technical Preparation of Production (TPV)

The role of TPV is absolutely irreplaceable; it is the key subsystem which in the data bank area establishes and maintains segments of the normative base. As such it holds an exclusive position in enterprise management and is the basic prerequisite for establishing and launching into operation the Operational Control of Production subsystem and other activities in direct support of production. Under automation conditions TPV forms the basis of all ASRP.

It performs primarily the following functions:

--generating basic structural and technological data regarding products and the conditions attendant to their production;

--storing, updating and turning over structural and technological data about products and the conditions of their production into a common data base or directly into another subsystem;

--monitoring and analyzing changes made in structural and technological data and standards;

--computing calculations (production-oriented) and interoperational price lists;

--compiling summary outlines about products and production technology for its own needs and for other subsystems.

As opposed to the ASRP/25 technical project, type elements for piecemeal, nonrecurrent production have been deleted from the TPV structure. Experience with the operation of the MARS system unequivocally showed that APV intended for serial production can be used for piecemeal production as well.

A dominant position among linkages of the subsystem is held by linkage to ORV, which under VARS conditions is mediated exclusively via a common central

data base. Of considerable importance are linkages between TPV and TEP, to which are transferred many consolidated standards and technoeconomical indicators. They form the basic prerequisite for the generation of the organization's economic plan and its intraplant breakdown. TPV is connected by many linkages to other subsystems as well.

2. Operational Control of Production (ORV)

A central position in the system of management of production enterprises is held by the ORV subsystem. It is one of the key tools for implementing the production function of an enterprise which belongs among the basic functions. These circumstances determine the central position of the ORV subsystem in ASRP, where it performs particularly the following functions:

--taking over, transforming and analyzing requirements on production;

--generating a system of production plans (starting with annual plans and ending with short-term plans for each workshop and work position), their specification and control of their implementation;

--controlling production in accordance with approved plans, acquiring and analyzing data regarding the actual progress of production in the form of feedback to the system of production plans.

The ORV subsystem, in the form in which it is turned over to users, is designed for any type of production, be it piecemeal, small, medium, or large series. It makes it possible to work with any combination or general manufacture; sliding scale planning. Its output are plans of deadlines, each production order (batch) is given a term for being put into production and being turned over from production in terms of days of the enterprise calendar.

These deadlines are also assigned to each operation, so that it is possible at any time to find out the volume of completed and incomplete production and analyze it.

The ORV subsystem offers considerable possibilities from the viewpoint of user variants. For example, only unlimited balancing of capacities can be done at the present time, but the second stage, by September 1984, will provide the possibility for automatic search for variable or replacement work posts.

Improvements are made in the subsystem on the basis of acquisition of findings from the user sphere. The greatest attention in the implementation of innovations is paid to the utilization of new technical means, particularly in the area of inputs and outputs and depending on the implementation of operations in real time mode.

The ORV subsystem has linkages to practically all other subsystems, either by means of a central or local data base, or local data base of other subsystems. Its basic linkage is to TPV. The ORV subsystem cannot operate without the latter.

Because the ORV subsystem tends to be the center of the system for management of an enterprise and several other subsystems act as its backup, direct linkages to points outside the enterprise are minimal and are limited for the most part to interenterprise cooperation. Its relation to ASRSC depends on the form of the VHJ's structural organizational arrangement.

3. Material and Technical Logistics (MTZ)

The basic task of the MTZ subsystem is to provide production with material of the requisite type, volume, quality and time. The production organization keeps commensurate stockpiles of materials to that end. The term commensurate denotes an economically justified need for:

--providing for available material stockpiles in an amount promoting a regular and continuous flow of production;

--limiting material stockpiles to the necessary amount in order not to tie up created values unproductively.

The devising of the MTZ subsystem is divided into two stages. The scope of the first stage corresponds to the demands placed on MARS, with potential for further expansion, particularly by MTZ planning problems and by deepening some of the basic functions.

The second stage presupposes expansion by additional TPK from the area of defective deliveries and storage of supplies where, in the case of large storage facilities, it is envisioned to control supplies by means of a control computer (SMEP).

The group of tasks currently being handled includes MTZ Planning, Classification of Supplies, Procurement Control, Material Inventory, Accounting and Analyses.

Most important among the established linkages are those to TPV and ORV. For example, already at the stage of specification of the production plan these linkages find application in the computation of the need for direct material, in setting up plans for material storage layout. Linkages between MTZ and ORV occur throughout the course of production and during the recording of its results. This is understandably also tied to extensive linkages of the MTZ and EKI subsystems. Because the MTZ subsystem provides production with material, its linkages to points outside the enterprise and to the median level of management are of extraordinary importance. Linkages to the median level of management involve, in addition to methodological problems, statistics and accounting, primarily documentation for the compilation of 5-year and annual plans, requirements on material projected for in the balance and resolution of disputes in supply-demand relations.

4. Personnel and Wages (PAM)

The PAM subsystem provides documentation for dealing with basic tasks in controlling cadre, personnel, social and wage policy of the enterprise, particularly for:

--personnel files;

--determination of manpower needs and its economic utilization;

--personnel welfare;

--providing for the requisite level of qualifications of personnel;

--regulation of wage development;

--evaluation of performance and remuneration of personnel.

The subsystem is divided into two stages. The first stage was dealt with in the scope of the MARS system whereby the subsystem was supplemented by several TPK from the task group remuneration of personnel, standardized norms were provided for the processing of wages and output reports for control and revision purposes, the capability of the fund providing information about employees was extended and verification was made of some more effective means for acquisition of data and economization of outputs.

In the second stage the possibility of using advanced computer technology, i.e., SMEP and a communication system, will be weighed.

The basic task groups being dealt with include Record Keeping, Bonuses for Personnel, Social Development of Personnel, Qualifications of Personnel, Wage Development, and Remuneration of Personnel.

Of particular importance among the internal linkages of the subsystem are linkages to ORV, NAR, ZAP, EKI and TEP. They are implemented in part through a common data base, in part through a local base, i.e., by means of operational sets.

With regard to linkages with external points, it must be pointed out that the subsystem has very many and important linkages to nationwide and central control systems. These linkages primarily take the form of obligatory accounting and reporting.

Documentation for obligatory accounting and documentation for cadre and personnel policy within a VHJ also constitute important linkages to ASRSC.

ELORG Permanent Exhibition

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 pp 729-730

[Text] The center of the All-Union Association V/O ELEKTRONORGTEKHNIKA (ELORG) in Prague has opened a permanent exposition of electronic products in Prague 1, Eliska Krasnohorska Street. On the occasion of the exhibition's opening, ELORG held a press conference on 8 October 1983 with the participation of the CSSR minister of electrotechnical industry, Prof Dr M. Kubat; the deputy minister of the USSR electronic industry, Comrade Suvorov; the general manager of the ELORG Center in Prague, Comrade Polyushkin; a representative of the CPCZ Central Committee and other official guests.

In his introductory address Comrade Polyushkin pointed out that ELORG was founded in 1970 as an export and import organization for foreign trade with the key mission of mediating the exchange of goods between participants in the Intergovernmental Agreement on Computer Technology, primarily in the assortment of JSEP and SMEP [Uniform System of Electronic Computers and System of Small Electronic Computers]. The export program of ELORG has expanded over the years and today a key position in the assortment is held by integrated circuits of a varying degree of integration in monolith and hybrid design classified according to speed, application, nature of processed data, etc. Users abroad have valued primarily the K 140, K 174, K 224 and K 237 integrated circuits. Increasing interest is also attracted by 16 K-bit memory circuits and microprocessor sets K 580, K 581, etc., with a speed of 1 million operations per second and, in the near future, exports will be enhanced by 64 K-bit memory circuits.

ELORG started with an annual turnover of approximately R 100 million; today, this amount has reached almost R 2 billion, where exports show a continuously rising trend with annual increments of 10-12 percent. A significant share accrues to integrated circuits in which the turnover increased fourteenfold from 1975 to 1982. Proposals for mutual deliveries in the current 5-year plan were specified in closer detail and represent an increase in deliveries from the USSR by 15 percent and in deliveries from the CSSR by 40 percent. Among the key suppliers in the CSSR are Zbrojovka Brno, ZPA [Industrial Automation Enterprises] Kosire, ZPA Novy Bor, ZPA Banska Bystrica, Aritma, Nisa Prosec; the major customers for the products of these manufacturers are the Soviet Minradioprom and Minpribor.

A new step on the path toward the consolidation of ELORG cooperation with foreign trade organizations of socialist countries are the permanent expositions that have already been opened in Hungary, Poland, the GDR and Cuba, with the Prague exposition being launched currently.

Minister Prof Dr Kubat gave an address in the final discussion. He pointed out the significance of Czechoslovak cooperation with Soviet production, particularly in the area of integrated circuits. He stated that the Czechoslovak electronics industry needs some 800-900 various types of digital

and analog integrated circuits, of which about 300 are supplied by the USSR, 100 by the GDR, while our own production turns out approximately 400 types. He also expressed his appreciation for the exhibit's opening as a positive step and expressed his hope for further promotion and expansion of collaboration with the Soviet electronics industry.

I-102 F Minicomputer

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 pp 731-740

[Article by Eng Milan Kukacka, Office Machines fiduciary concern organization, Prague: "Independent I-102 F Minicomputer"]

[Text] The I-102 F minicomputer is a high-performance computer system which in its technical properties approaches those of the domestically produced computer of the SM 52/11 type. Its performance and potential rank is among the top models in the international program for minicomputers in the CEMA countries.

It is particularly suited for:

--scientific and technical applications;

--economic calculations;

--statistical calculations;

--processing in real time;

--control of technological processes;

--remote data processing;

--devising of computer and terminal networks.

The I-102 F minicomputer is produced in the Romanian Socialist Republic by the ICE FELIX company and is delivered through mediation by Office Machines Prague. Importation of these minicomputers is envisioned to continue in the coming years.

Linkage to other SMEP [System of Small Electronic Computers] systems is provided by compatibility of programs and media and by standardized interface for remote data processing.

2. Basic Characteristics of the I-102 F Minicomputer

The I-102 F minicomputer is an all-purpose word-oriented computation system offering a wide area of applications. It is technologically based on TTL (SSI, MSI) logic integrated circuits, MOS (LSI) memory circuits and on four-layer printed circuits. It is characterized particularly by:

--word length of 16 bits;

--direct addressing of operational memory up to 32 K words (64 KB);

--expanded addressing of operational memory to 128 K words (256 KB);

--controlled parity of each bit;

--high performance instruction network with an expanded set of instructions (EIS) with single and double operation instructions, including instructions for arithmetic with a floating order comma and instruction for user microprogramming;

--operation with storage memory;

--potential for direct access to memory (DMA);

--automatic interruption system;

--an extensive set of high-performance peripheral systems;

--multiprogram operational system in real time with high-performance translators;

--telecommunication network software;

--protection against feed voltage outages;

--high-performance dignostics.

The I-102 F minicomputer system is made up of a processor, operational memory and attached input/output peripheral systems.

The processor includes a basic processor unit and expanding processor blocks.

The basic processor unit--consisting of a control unit, an arithmetic/logic unit, block of expanded addressing (memory organizer), microprogram control memory, instruction emulator, programmable timer and buffer memory (CACHE)--is connected to two system busbars INTERBUS and MEMOBUS.

INTERBUS is the computer's inner busbar providing for dialogue between the basic unit and individual peripheral devices.

MEMOBUS is a simplified version of INTERBUS using the same mode of operation. It provides a connection between the basic unit and memory and, further, between the memory and devices with DMA, i.e., magnetic disks. The basic processor unit organizes the exchange of information in the system and also performs the set of internal instructions of the system. This internal set of instructions is processed by means of microprogram memory and a decoding emulator of instructions so that the computer's set of instructions is identical with the set of instructions of computers of the PDP 11 series.

The block of expanded addressing makes it possible to address the memory up to 128 K words, i.e., expansion of user operational memory from 28 K words (56 KB) to 124 K words (248 KB). The last 4 K words (8 KB) of addressing space are intended for systemic purposes (addressing of input/output devices). It further administers the protected memory pages, their control, dynamic placement in the memory, etc. The CACHE buffer memory accelerates access of the processor to data and instructions stored in operational memory.

The expanded processor blocks are the processor for arithmetic in floating order comma and user control memory.

The processor for arithmetic in floating order comma makes it possible to perform arithmetic computations at high speeds. It operates with simple or double accuracy. It contains a set of six accumulators with 64 bits each, and an arithmetic unit with a control register. The set of hardware-solved instructions for the floating order comma thus expands the basic instructional set and considerably speeds up processing in the languages FORTRAN and BASIC (approximately 20x).

The user microprogram control memory is a random access memory (RAM) expanding the basic microprogram control memory (PROM) in the system of the basic processor unit. It makes it possible to expand the instruction network by special user instructions, microprocessor implementation of frequently used programs and hardware simulation of the instructional set.

Operational memory consists of 16 Kbit MOS chips and is formed maximally by two blocks with 128 KB capacity.

The set of supplied input/output peripheral systems of the I-102 F minicomputer is formed by an operator's console, two magnetic tape and two magnetic disk memories, a line printer, picture tube terminals, adjustable perforated tape peripheries and a punch card reader, the requisite control units, communication adapters and an asynchronous multiplex. The magnetic disk and tape memories are equipped with a block for DMA.

The DMA system facilitates the direct transmission of data between the internal memory and the given system without processor participation. As soon as the central processor acquires through INTERBUS the requisite information for the transmission of DMA data, the DMA unit is logically disconnected from INTERBUS and control of data transmission between the peripheral system and memory is taken over by MEMOBUS.

The operator console of the system is addressed as a common periphery. The operator can control the operation of the processor, address the main memory, or the expanded microprogram memory, registers the system, registers of the state of programs, etc. It is formed by a mosaic printer with a keyboard, a control unit and its own clock.

Technical equipment of the I-102 F minicomputer is supported by the supplied operating systems MINOS/MININET and AMS, as well as operating systems for the PDP-11 computers of the Digital Equipment Corporation.

In structural design the I-102 F minicomputer is formed by the basic stand, stands of magnetic tape units and other peripheral equipment located independently and connected by cables. The dimensions and structure of the stands meet the SMEP standard. The basic stand contains grates with plates of the processor, memory, adapters and control units, programming panel, power sources and ventilators. The basic stand can also accommodate perforated tape peripheries.

3. Technical Equipment

a) Processor

Technical Specifications:

word length	16 bits
operands	8 and 16 bits
number of all-purpose registers	8
number of addressing modes	12
number of instructions	136
operational speed	maximum 2.5 million operations per second (register-register)
capacity of control memory PROM	2 K words
width of control word	51 bits (48 control + 3 parity)
capacity of CACHE memory	2 KB
cycle of CACHE memory	150 ns
programmable timer	internal time pulses 100 kHz and 10 kHz controlled by crystal, external time pulses 50 Hz (from network) or random frequency of TTL signal from outside
processor of floating point	makes possible imaging of "real"-type numbers in 2 or 4 words (23 or 55 bit mantissa, 8 bits component, 1 bit sign) and "integer"-type numbers in 1 or 2 words (including the sign)
capacity of user control memory RAM	maximum 2 blocks with 1 K words each

[see Figure 1 next page]

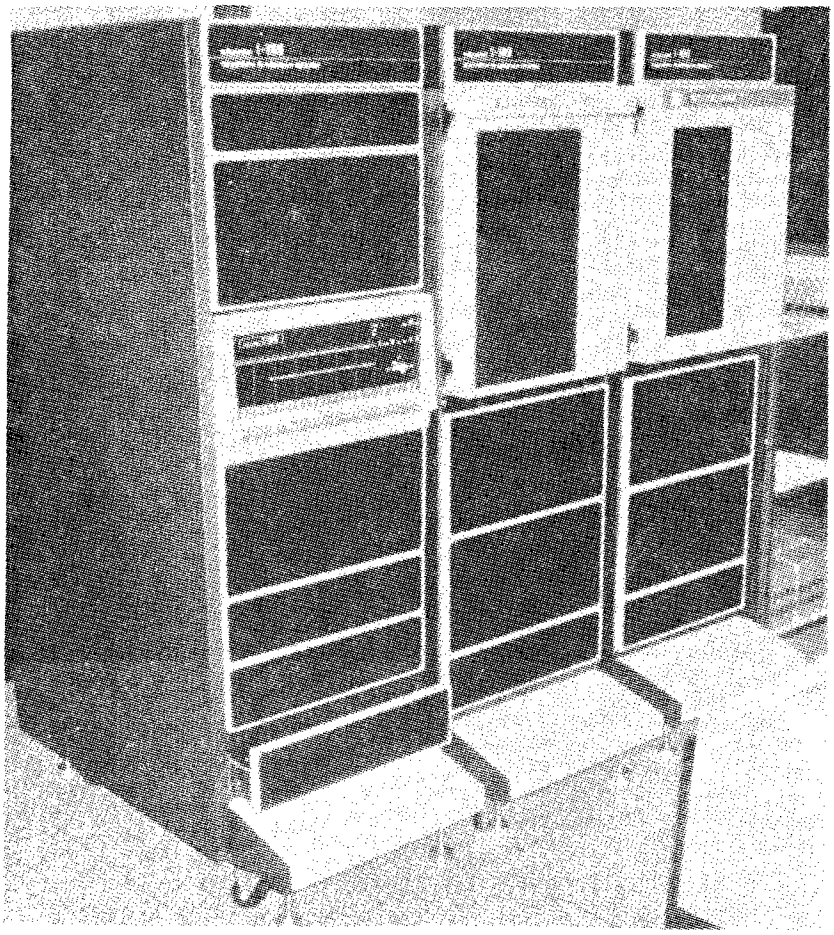

Figure 1. Basic unit with magnetic tape units

b) Operational Memory

Technical Specifications:

capacity	maximum 2 blocks with 128 KB each, last 8 KB blocked for systemic purposes
operational memory cycle	650 ns

c) Input/Output Peripheral Systems

--Magnetic Tape Memories

The magnetic tape system consists of a unit for direct access into the memory, a control unit which makes it possible to connect up to four magnetic tape units to the magnetic tape units proper.

Technical Specifications:

tape type	standard 0.5 inch tape
recording density	adjustable 800/1600 bpi
tape length	maximum 2400 ft
reading speed	37.5 or 45 ips
recording type	PE 9 ft for density of 1600 bpi NRZ 1 9 ft for density of 800 bpi
transmission speed	30/60 KB/s or 37/72 KB/s

--Punch Card Reader

The subsystem contains a reader of standard 80-column cards with the requisite control unit.

Technical Specifications:

reading speed	600 cards/min
reading principle	photoelectric
capacity of input/output magazine	1000/1000 cards

--Punch Card Reader/Puncher Module

Contains a punch card reader and puncher with a control unit.

Technical Specifications:

carrier medium	perforated paper tape, 8 ft
reading speed	300 char/s
punching speed	75 char/s

--Linear Printer

This set contains a wide-line high-speed printer with a type strip and the requisite control unit.

Technical Specifications:

printing speed	900 lines/min
number of characters per line	132
set of characters	64 standard ASCII characters
number of copies	1 to 6
line density	6 or 8 lines/inch
print density	10 characters/inch

--Large-Capacity Disk Memories

The magnetic disk subsystem consists of a unit for direct access into memory, a control unit which makes it possible to connect up to four magnetic disk units with exchangeable disk sets with a capacity of 58 MB each and the magnetic disk units proper.

Technical Specifications:

number of sectors	12
transmission speed	213 KB/s
disk turning speed	2400 rev/s
average access time	37 ms
average waiting time	10 ms
total set capacity	58 MB

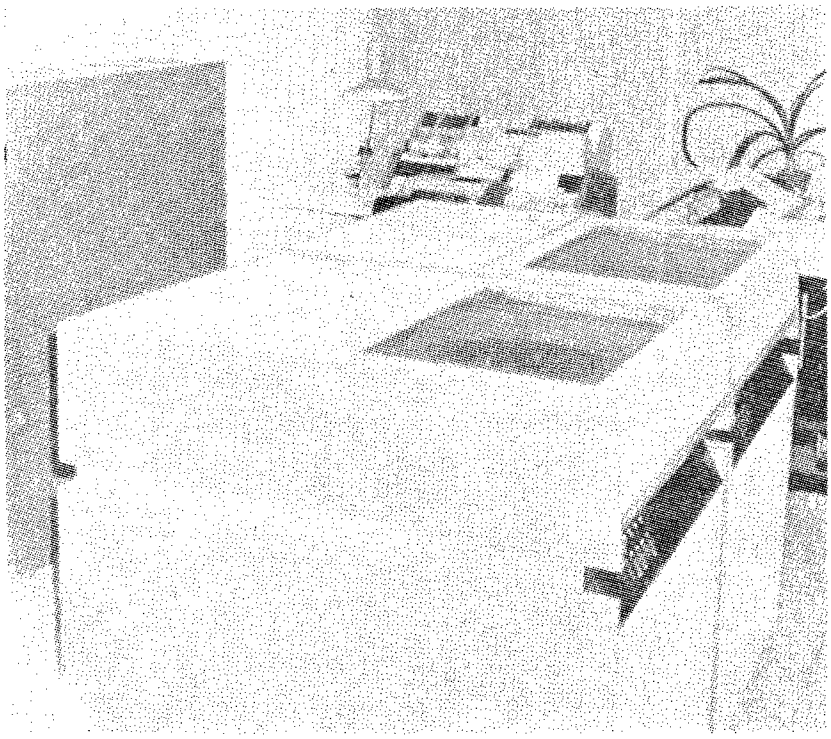

Figure 2. Large-capacity 58 MB disk units

--Asynchronous Adapter

A series asynchronous single-line adapter for connection with an asynchronous system, e.g., terminal, computer, either via modem for unlimited distances, or in local mode with a current loop up to 500 m.

Technical Specifications:

transmission speed	50 to 9600 bit/s
character format	5 to 8 bit
stop bit length	1; 1.5; 2 bits
interface	S2 according to CCITT V.24 and IRPS current loop
transmission mode	parity
transmission type	full or half duplex

--Asynchronous Multiplex

This is a system with direct access memory (DMA) for connecting a maximum of eight terminal lines. Output is in mode of interruption after character. Separate timing is generated separately for each line from a common crystal oscillator, making it possible to select the speed for each line by program. Two FIFO buffer memories with 64 characters each serve for data recording.

Technical Specifications:

transmission speed	50 to 9600 bit/s
character format	5 to 8 bit
stop bit length	1 or 1.5 bit for 5-bit character 1 or 2 bits for a 6 to 8-bit character
interface	S2 according to CCITT V.24
transmission mode	parity

--Synchronous Adapter

This single-line series synchronous interface provides linkage between the computer itself and a series synchronous line. It is suited for providing connection with another synchronous system, e.g., another I-102 F computer or the I-100 computer in the MININET network, or for connection with a hierarchically higher JSEP computer.

Technical Specifications:

transmission speed	600 to 9600 bit/s
transmission protocol	byte-oriented (e.g., SDLC, HDLC) bit-oriented (e.g., BSC, DDCMP)
type of transmission	full or half duplex
interface	S2 according to CCITT V.24 with full modem control

--CDC 9334 Character Printer

Mosaic printer with microprocessor control. It is designed for connecting to the DAF 2010 videoterminal for printout of picture tube contents (hardcopy).

Technical Specifications:

printing speed	150 characters/s (in both directions)
number of characters per line	136
print density	10 characters/inch
buffer memory capacity	256 characters

--DAF 2010 Intelligent Videoterminal with Keyboard

It is connected to the I-102 F minicomputer via a synchronous multiplex, or via a single-line asynchronous adapter.

Technical Specifications:

picture tube capacity	1920 characters (24x80)
character imaging	matrix 5x7 points
imaging modes	normal (while characters on dark background) and inverse (dark characters on white background)
number of imageable characters	96 standard ASCII
number of keys	101 in three fields--functional, numeric and alphanumeric
communication interface	CCITT V.24
connecting distance	unlimited via modem, locally--in view of interference--15 m under worst of conditions, otherwise on the order of tens of meters
possibility for connecting a (hard-copy) mosaic printer	via adjustable printer adapter with S2 interface according to CCITT V.24
operating mode	character, line, page

The videoterminal is capable of operating with graphic characters for drawing graphs and tables with control characters. With the aid of the requisite firmware it is possible to use other semigraphic functions with an expanded set of graphic characters.

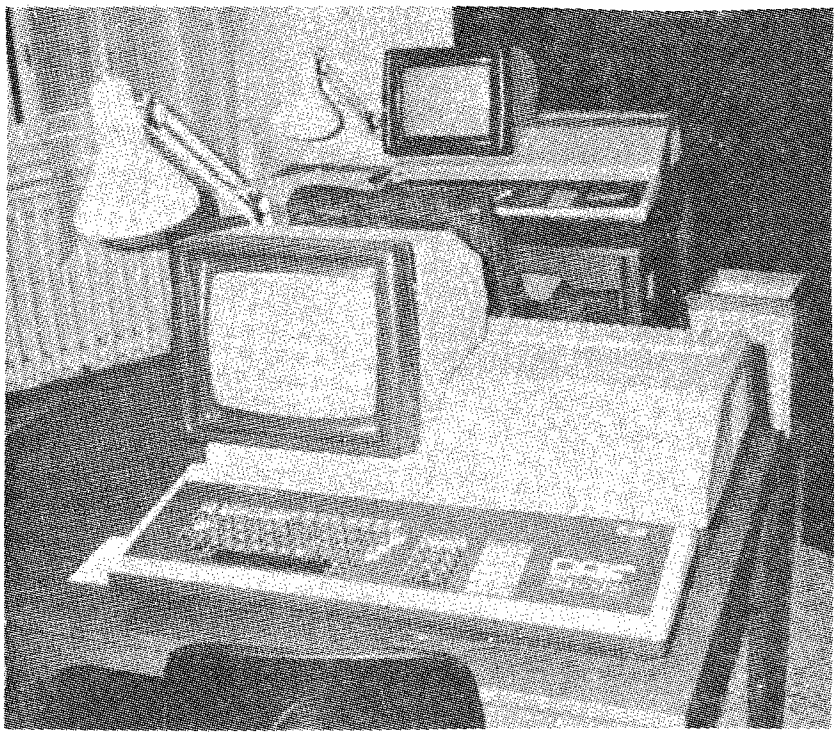

Figure 3. DAF 2010 display work station

--Centronix Asynchronous Terminal

A series asynchronous terminal on the principle of a mosaic printer with keyboard. This terminal is used also as operator's console for the system.

Technical Specifications:

printing speed	60 characters/s
number of characters per line	132
set of characters	64 standard characters ASCII
control mode	microprogram
communication interface	IRPS--current loop or S2 according to CCITT V.24
maximum connection distance	up to 500 m via current loop, same as DAF 2010 via CCITT V.24

4. Software

With the hardware system comes, for a change, a complete set of software bearing the designation MININET/MINOS V.1.0 which is formed by the following items:

--disk operation system MINOS V.2.1 (MINicomputer Operating System), resembling the company's operating system DEC RSX-11M;

--software MININET, making it possible to form terminal and computer networks in simple and extensive configurations, with possible linkage to a similar program product DECNET V.2.0 of the DEC company (corresponding to the Czechoslovak product SYRPOS) and DECNET V.3.0;

--translators, interpreters, service programs and libraries: MACRO, FORTRAN IV, COBOL, BASIC, SORT, BIBMAT (program library for mathematical calculations).

The operating system also supports the following translators of the DEC company: residential operating system for testing of hardware MINOS/TEST, FORTRAN IV V.2.52, FORTRAN IV PLUS V.3.0, FORTRAN 77 V.4.0, COBOL V.4.1 including SORT V.2.0 and RMS-11K V.1.8, BASIC PLUS 2, PASCAL, RTL-2, LISP, etc.

In addition to the MININET/MINOS software comes, free of charge, the AMS adaptable operating system with the requisite translators, interpreters, service programs and libraries suitable for smaller applications.

Robotron Image Processing Systems

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 pp 741-743

[Article by Eng Egon Hoffman, Robotron, GDR: "Microcomputer-Aided Image Processing System"]

[Text] The Robotron combine offers the BVS Robotron A 6471 through A 6473 digital image processing systems. The BVS easily meets demanding requirements

on an international scale and takes into consideration the latest findings made in remote space surveying of the earth. The system is the result of joint R&D by the GDR Academy of Sciences, the Robotron combine and the Soviet center for remote surveying of the earth, GOSNIZIPR.

The Robotron image processing systems include in their three variants a balanced combination of:

--the latest computer systems,

--special processors,

--special terminals,

--user-oriented software.

These image processing systems represent a new sphere incorporated by Robotron into its production program. The use of these systems significantly promotes advances in many fields, primarily space research and medicine, as well as in modern industrial technology. Even though BVS will probably find its widest application in industrial sectors, it remains at present the most notable and most interesting system for processing images taken from aircraft, artificial satellites and spaceships. The interpretation of multispectral, meteorological and cartographic photographs promotes the discovery of natural resources, timely identification of damage to the environment, warning of impending catastrophes, physical and thematical mapping, taking inventory of and predicting agricultural crops, weather prognoses, etc.

Interactive and automatic analyses of thermographic, sonographic, tomographic and microscopic photographs represent a qualitative advance in medicine and biology. Typical examples are the automatic evaluation of X-ray photographs, automated cytological examinations, chromosome analysis, etc.

The industrial sector uses the system for processing images in automated quality control, for controlling processes involving moving objects, for evaluating measured acoustic and thermal values, etc. This brief mention of some of the system's applications is far from exhaustive. Fields such as astronomy, archeology, evaluation of materials use, e.g., employ automated image analysis already at the present time. With the gradual introduction of this technology its areas of application will expand even more.

Robotron offers three hardware models: A 6471, A 6472 and A 6473.

The A 6471 system--an all-purpose computer system for digital processing of images--consists of the following parts:

--K 1630 microcomputer,

--operational memory,

--disk memory,

--color display for 512x512 points with monitor and image memory,

--operator unit for interactive dialog between user and system,

--device for insertion and removal of film.

The BVS A 6471 is an optimal system for R&D installations and for centers offering a wide spectrum of services.

The A 6472 system--a display system for high-speed image processing--consists of the following parts:

--K 1620 microcomputer,

--operational memory,

--magnetic disk memory,

--display processor operating in real time,

--image memory of 1 M byte capacity,

--color monitor for 512x512 points,

--operator unit,

--graphic display,

--device for insertion and removal of film,

--network switch,

--video output,

--video input.

The BVS A 6472 processes images within milliseconds or up to a few seconds with direct imaging of the results on a color monitor. It is suited for dealing with routine tasks, such as, e.g.,:

--research and analysis of a large volume of photographs,

--monitoring of natural phenomena in real time,

--automated quality control and classification in the sphere of production.

In this context the basic structure of the variant A 6471 is expanded by special devices for the high-speed processing of individual and multiple photographs.

It meets all requirements on analysis of photographs in real time for photographs of up to a 512x512 byte format.

The A 6473 system, a display complex for operational image processing--the highest-performance configuration--consists of the following systems:

--four A 6472 display systems for high-speed image processing,

--multiple image memory for four 512x512 byte images,

--device for insertion and removal of film.

The main areas of A 6473 application are larger centers processing a considerable volume of photographic material. Users can coordinate image analysis on four high-speed A 6472 display systems. The multi-image memory--which can be used by all four display systems simultaneously--considerably accelerates the analytical process. The performance is cost-effective in comparison with systems using a single display tube.

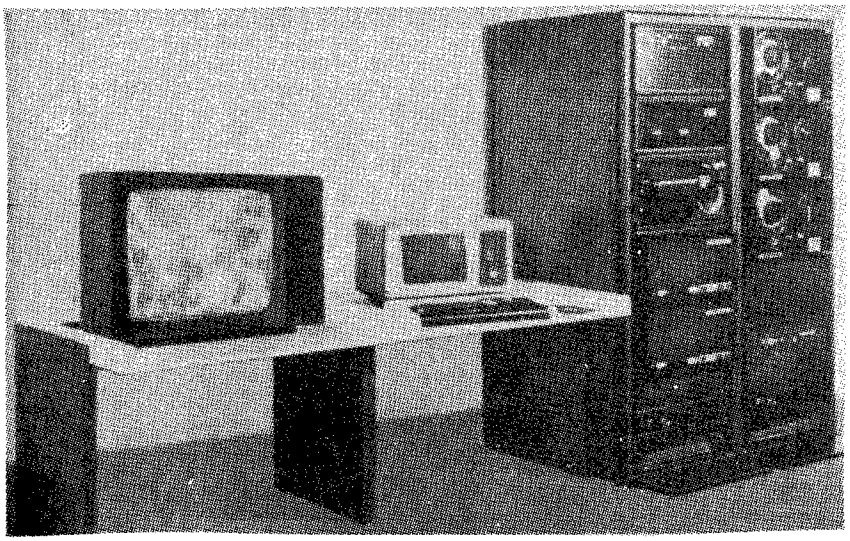

Figure 1. A 6471/A 6473 display processing system

A special operating system of virtual administration of image data and mnemotechnics on the display make it possible for the user to deal with image processing problems economically without knowledge of programming languages and hardware. Simple assignment of parameters makes it possible to perform important basic algorithms for coding, restoration, enhancing of images, for acquisition of characteristic traits and recognition of objects. Numerical accuracy and format of images can be selected at random. The following software is available for the BVS system:

--MOOS 1600 disk operating system for operations in real time,

--specialized operating systems for image processing according to a selected configuration,

--user programs for digital image processing with developmental systems for expansion of user software according to the user's specific needs,

--set of instructions for operating the individual systems and processors.

Robotron Remote Processing Systems

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 pp 749-753

[Article by Eng Egon Hoffmann, Robotron, GDR: "Applications of Directional Radio Technology in the Area of Long-Distance Data Transmission"]

> [Text] On the basis of its many years of experience with the development and production of electronic computer systems and on the basis of experience gained through cooperation with partners at home and abroad, the Robotron combine produces and delivers systems for remote data processing connected with the EC 1055/EC 1055 M computer. These systems have been successfully applied in financial, transportation and commercial enterprises as well as in industry and agriculture.

The combine's export program has included directional radio systems for 25 years. Wide-band and narrow-band directional radio systems form an integral part of national and international transmission of messages. The newly developed PCM 10-400/800 system, which was originally intended for telephone networks, fully meets the demands made on remote data processing. The modular concept of this so-called radio link meets the current international requirements on the number of data and/or telephone channels. This digital-type directional radio system has 10 telephone or data channels with maximum transmission speed of 64 k bits/sec. Their number depends on modular arrangement.

In addition to conventional modem-aided data transmission via telephone channels, it facilitates the digital input of data signals at transmission speeds ranging between 50 bits/sec and 64 bits/sec into PCM channels. If international recommendations, such as CCITT and CCIR, are complied with, multivariable use is possible, i.e., with corresponding foreign technology within remote data processing. The use of this directional radio system as a transmission path for digital data facilitates the expedient establishment of new data transmission networks (as "overlay") independently of existing transmission systems and/or the establishment of networks in new areas.

Directional communications technology considerably expands the possibilities in remote data processing. It can be used even in instances where it was impossible with contemporary transmission media or possible only at extraordinarily high costs.

If need be, the telephone channel can be used as a service channel offering the following capabilities:

--permanent service channel with omnibus calling and possibility for calls between random stations,

--temporary service channel in random channel between two stations.

Operational control is performed:

--in lines through error control by catchall codeword,

--in radio field by synchronous PCM control,

--remote by digital signals in PCM pulse frame,

--by telephone through the service channel among all stations.

Typical obstacles to data transmission are:

--areas with extreme weather effects and interference,

--scaling of impenetrable or unexplored regions (e.g., mountains, rivers, lakes, and deserts),

--mobile transmission and reception points,

--reception of information from the atmosphere.

The properties of the new PCM 10-400/800 directional transmission systems make them suitable particularly for application in:

--relatively unknown regions;

--regions in which telephone connections still use open lines permitting no data transmissions due to interference effects;

--existing enterprise complexes in which production control tasks are to be handled through remote data processing and laying of cables could cause breakdowns in production;

--setting up of emergency systems independent of telephones in industrial enterprises, e.g., dispatcher-operators, dispatcher-control computer;

--transmission of information between control computer and terminal, or between control computer and open pit mines;

--the petroleum industry between computer and drilling or extraction towers;

--systems for natural gas and crude oil transportation through pipelines between central points and control stations;

--the establishment or extension of meteorological service for transmission of information about weather in remote observation or radar stations, e.g., in mountains;

--connections within remote data processing for applications of computer technology dealt with by Robotron: ARS--automated reservation systems, REG--computer applications in banking, LIS--information control systems.

The use of directional communication technology is of particular importance in industrial complexes, e.g., the petrochemical industry, natural gas industry, coal mining, in steel mills, for connections over short distances up to 50 km, as well as for technical connection to existing directional communication lines or networks. Existing PCM channels, e.g., PCM 30 and PCM 120, can also be incorporated into a transmission system with PCM 10-400/800, when corresponding digital interfaces are available.

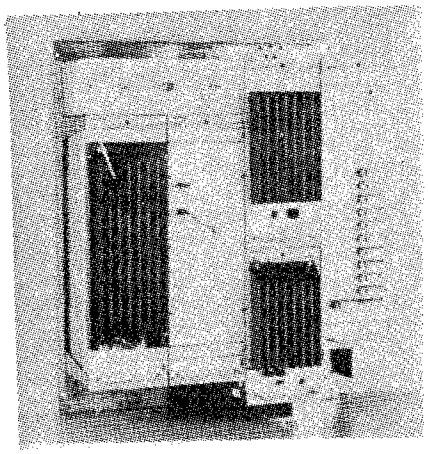

Figure 1. System PCM 10-400/800

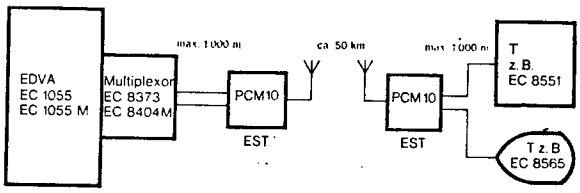

Figure 2. Transmission by means of a single radio field

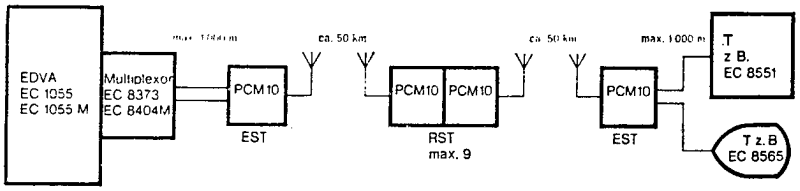

Figure 3. Transmission with several radio fields

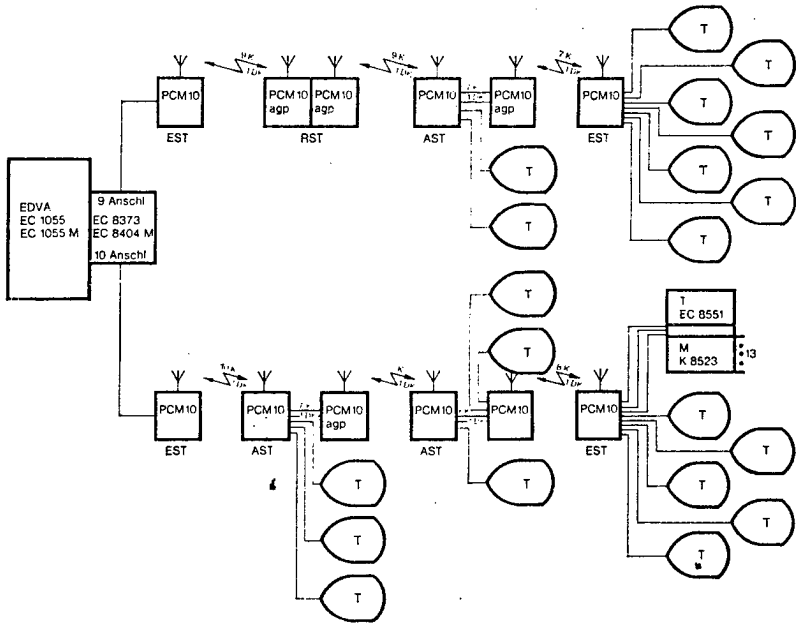

Figure 4. Representation of data processing by means of PCM 10-400/800

EDVA -- computer system
AST -- branch
EST -- terminal
RST -- relay
agp -- connected
Anschl. -- connection
DK -- service channel
K -- data channel
T -- terminal
M -- multiplex

The transmission distance between two transmitting and receiving devices, also called normal field radio length, amounts to approximately 50 km, depending on the quality of the earth's surface. Most favorable conditions for transmission are created by direct visibility between transmitting and receiving stations. Spanning longer distances calls for the inclusion of relay stations. The newly developed system permits the creation of a random

network structure, e.g., linear, radial or polygonal structure. Interfaces of data channels conforming to CCITT recommendations with all the requisite transmission speeds of up to 64 k bits/sec on directional radio systems make it possible to connect existing terminals and computers of the Robotron combine.

Connecting devices of other producers into remote data processing systems calls for modifying the software of the corresponding hierarchically higher computer. The distance between the directional radio system and the connected terminal or computer by cable can be up to 1,000 m. Longer cable lengths call for short-distance data transmission (DNO).

As most terminals are dimensioned for medium speeds of data transmission, such as 0.6 to 9.6 k bits/sec, it appears viable to use a concentrator or data multiplex to use the PCM system's speed of 64 k bits/sec.

Brief Characterization of the PCM 10-400/800 Digital Directional Radio System

Structure

The system uses a vertical arrangement. Instruments belonging to the directional radio link always form a structural unit and can be arranged at random by placing them into narrow fields built into a wall-mounted frame. Connection between the directional radio system and the antenna is provided by a coaxial cable. A dipole antenna was used for horizontal and vertical polarization. The range of radio frequencies is 390 to 470 MHz, and 790 to 960 MHz. The directional radio system is designed for transmission in 2 to 10 digital channels with a cumulative transmission speed of 704 k bits/sec.

Use of a built-in integrated special multiplex in the directional radio system offers the possibility of establishing branches and connecting one or more channels. Branching off or connection in the case of data channels occurs at the 64 k bits/sec level.

Climatic Conditions

Instrumentation

--range of temperatures	-10°C to +50°C
--relative humidity	95% at +35°C

Antennas:

--range of temperatures	-50°C to +50°C
--admissible wind velocity at	
full operational capacity	100 km/h
at limited operational capacity	200 km/h

Power Source

--nominal voltage (eff.)	110 V, 127 V, 220 V
--voltage tolerance	-20% to +10%
--frequency	47 to 63 Hz
--power input at terminal	approx. 60 W
--power input at relay point	approx. 100 W

Maintenance

--service life	approx. 20 years
--maintenance	at 2 year intervals
--median duration of repair	1 hour

Robotron Savings Bank Terminal

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 pp 771-772

[Article by Eng E. Hoffmann: "Robotron K 8924 Terminal for Banks and Savings Banks"]

[Text] The Robotron K 8924 bank and savings bank terminal is an intelligent, freely programmable and microprocessor-controlled terminal with a display unit. It is characterized by a uniform modular structure of all its hardware and software components and a flexible configuration. This provides an opportunity for adapting it to any specific conditions at counter operation in banks and savings banks as well as in installations of the postal administration.

Its key areas of application are, e.g.:

--current account operations,

--recording of deposits,

--checking account operations,

--credit operations,

--loan accounts,

--travelers' foreign exchange,

--internal information system for the bank's management and planning,

--trading in securities and bills of exchange,

--data acquisition and analysis, as well as many other independent organizational tasks.

The terminal can operate as part of a computer system or autonomously for the primary processing of documentation. The core of the Robotron K 8924 bank and savings bank terminal is a control unit consisting of components of the K 1520 microcomputer with controls for peripheral systems and long-distance data transmission. If needed, one or two modules can be added for flexible disk, miniflops or tape cassette.

The keyboard, display, printer and a reading or printing and reading unit for money cards are installed as separate desktop systems. The system is provided with security systems preventing its use by unauthorized personnel.

Technical data

Control Unit:

--K 1520 microcomputer with supplementary equipment;

--internal RAM, ROM and PROM memory for the operating system, data and user programs expandable up to a maximum of 112 K bytes;

--power source, including turning the system on and off.

Supplementary equipment:

K 7221 monitor: 1,024 characters;

--terminal keyboards, including alphanumeric keyboards and functional keys;

--magnetic data carriers: MF 3200 elastic disk and/or K5600.10 miniflops (single unit capacity: 250 or 130 K bytes), K 5200 cassette tape unit (capacity 260 K bytes);

--Robotron 1152 or 1157 printer;

--modular assembly for monetary cards consisting of: a simple reading unit for manual insertion of cards, an automatic reading unit, an automatic printing and reading unit;

--data transmission: up to 500 m via IFSS, over 500 m synchronously via V.24, X.21 with procedures AP 62/64/BSC3, maximum transmission speed up to 9,600 bits/s.

Potential for expansion:

--K 6357 terminal printer;

--customer keyboard.

Power network connection: 220 V +10%-15%; 50/60 Hz, nominal power input depends on configuration, up to 540 W. Weight, depending on configuration, 90-120 kp.

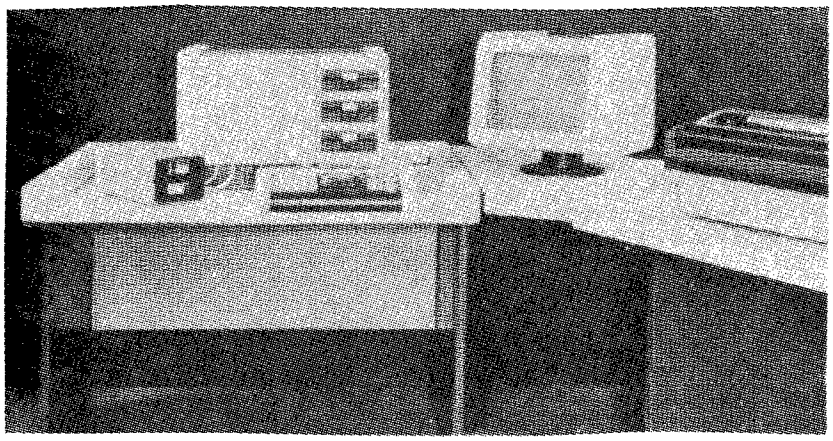

Figure 1. Robotron K 8924 bank terminal

Robotron Digitalization Unit

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 pp 772-773

[Article by Eng E. Hoffmann: "Digitalization Unit With High Resolution for Graphic Data Processing"]

[Text] The digitalization unit with high resolution, produced by the Robotron combine, is a compact desk-top device with on-line operation concept. It serves for the acquisition of graphic data. Preprocessing and condensing of such data is done by means of a built-in computer. In addition to basic graphic functions, the user can apply specific instructions. The latter are processed on the basis of systemic instructions and special user software.

The digitalization device consists of a swinging measuring plate, an integrated unit and RAM memories from the Robotron K 1520 microcomputer, including IFSS interface, as well as a freely moving sensor of measured values. The digitalization process is based on the inductive measuring principle. By dividing the progress of measurements into rough and fine measurements it is possible to achieve the necessary speed and requisite resolution. Digitalized values measured along the entire surface show a precision of 0.01 mm with the use of course sensor and 0.05 mm with a tip.

Its software includes various program sets, e.g., a microtesting program, functional software for the device itself, digitalization software for the basic computer, which facilitates inclusion into the program set "Graphic Basic System." Its high resolution, precision in reading of coordinates at high performance and outstanding ergonomic properties predestine the unit for application particularly in the fields of: electrotechnical engineering/electronics, geodesy and cartography, medicine, civil engineering and mechanical engineering.

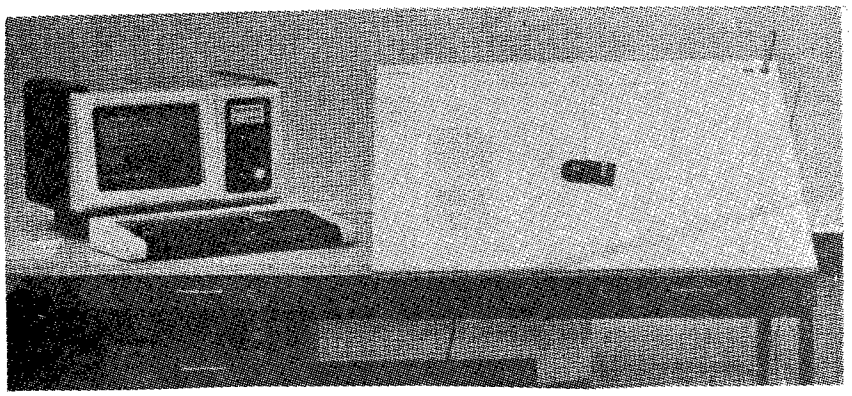

Figure 1. Robotron high-resolution digitalization unit

Robotron Thermal Tape Printer

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 pp 773-774

[Article by Eng E. Hoffmann: "Robotron TSD 16 Thermal Tape Printer"]

[Text] The Robotron TSD 16 is a nonmechanical tape printer. Output data are printed continuously on a 57 mm wide journal roll with thermoreactive paper. This tape printer is a built-in device and consists of the following functional groups:

--thermospacing head,

--control electronics,

--step motor for paper feed,

--paper roll holder.

The thermospacing head provides for printout of data in parallel without mechanical movement of printing elements. In addition to numerical printing, it also provides for alphanumeric printing. Paper feed can also be done manually. The end of the paper roll is signalled by the device automatically, making it possible to prevent loss of data. The tape printer has a specific TTL interface.

The Robotron TSD 16 finds successful application as a tape printer in:

--control and measuring systems,

--microcomputers,

--desk-top and pocket calculators,

--simple numerical devices for data recording.

Technical data

printing principle	thermal printing
printing speed	2 lines/sec
type of printing	point line
printing capacity	16 characters/line
character font	alphanumeric
character imaging	5x7 point scan
character division	2.54 mm
character height	2.88 mm
character width	1.90 mm
line spacing	4.23 mm
paper feed	stepping motor--rubber platen
paper roll diameter	60 mm
feeding width	57 mm
type of paper	thermoractive paper
dimensions (wxhxd)	112x44x137 mm
weight	0.335 kp

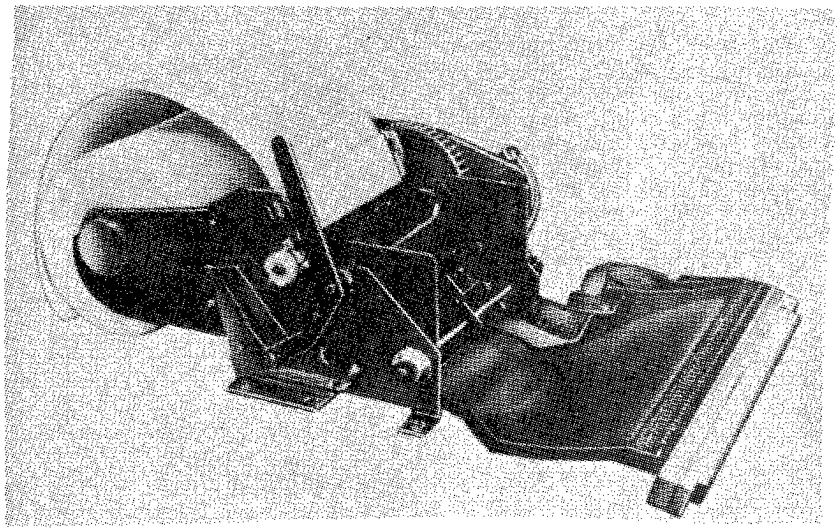

Figure 1. Robotron TSD 16 thermal tape printer

Robotron TD 40 Thermoprinter

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNICKY in Czech No 6 1983 pp 774-776

[Article by Eng E. Hoffmann]

The TD 40 thermoprinter is a nonmechanical alphanumeric printer used as an output device where printout without copies is required. Output data are printed in lines on a 90 mm wide journal roll of thermoreactive paper.

The Robotron TD 40 comes as a modular assembly without casing or as a desk-top unit. The printer consists of the following modular elements:

--printing part including a terminal spacing head,

--control electronics with interface,

--power source.

The Robotron TD 40 thermoprinter is intended primarily for the following areas of application:

--telephone terminals,

--control and measuring systems,

--devices using display units,

--telex systems,

--personal and home computers,

--R&D computers.

Technological Data

printing speed	1 line/sec at average spacing and alphanumeric 5x7 printing
printing principle	240 points without spaces
grid field	6x10 points
print grid	5x7 (upper case), 5x9 (lower case)
symbol set	G0, G1, G2 acc. to CCITT, G0 fixed G1 and G2 conditionally substitutable
number of symbols per line	40
grid spacing	0.3 mm horizontal, 0.3 mm vertical
paper type	thermoreactive paper
form used	roll
paper width	90 mm
roll diameter	60 mm
interface	CCITT/V24/V23
voltage	220 V ± 10%, 50 opt. 60 Hz
power input	maximum 70 W

Operational conditions:

operational temperature	-5°C to +40°C
transporting temperature	-40°C to +50°C
storing temperature	-30°C to +40°C
relative air humidity	85% at 10°C
maintenance	not required
indication	end of paper, torn paper
paper feed	1 line forward, line spacing about 3.6 mm, manual feed forward at random

dimensions of covered modular parts:

printer (wxhxd)	165x65x185 mm
power source (wxhxd)	215x65x90 mm
printer weight	1.10 kp
power source weight	1.35 kp

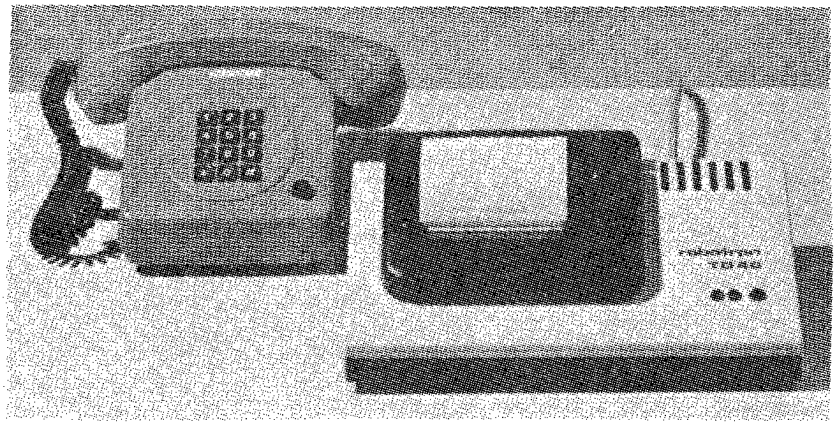

Figure 1. Robotron TD 40 thermoprinter

Robotron 1152 Serial Printer

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 pp 776-777

[Article by Eng E. Hoffmann]

[Text] The newly developed serial printer Robotron 1152, model 225 has modular structure and is characterized by exceptionally simple operation. The printer operates with an exchangeable-type wheel. Excellent quality of lettering, connection in series and in parallel as well as simple operation with automatically controlled functions are characteristic features of the high performance and all-purpose applications of this printer. It can be used for printing paper pages as well as paper with side perforations. The Robotron 1152, model 225 serial printer is used primarily as an output device for personal and home computers, measuring and control systems and for text processing.

Technical specifications:

printing principle	printing by type wheel
number of symbols in font	96
printing speed	40 characters/sec, 35 characters/sec of standard text selected at random according to the type of script and specifics of individual countries

characters per line	132 or 158
fed paper width	380 mm
printing direction	forward/reverse
margins	fixed left margin, variable left and right margins, controllable by software standard cassette ribbon, 13 mm endless black or black/red cloth ribbon, 6.35 mm endless cloth ribbon, carbon ribbons as singlestrike or multistrike
ribbon end indication	luminous signal
paper feed	form band for paper with side perforations, manual feed of individual pages with automatic positioning
option	mechanical sheet-feeder connection for automatic feed of individual sheets
paper end indication	luminous signal
intermediate memory	512 bytes
interface	in series V24--RS232 C, in parallel--Centronics 8 bits
power feed	220 V +10% -15% or 110 V +10% -15%
power input	approximately 120 W
dimensions (wxhxd)	635x175x370 mm
weight	25 kp

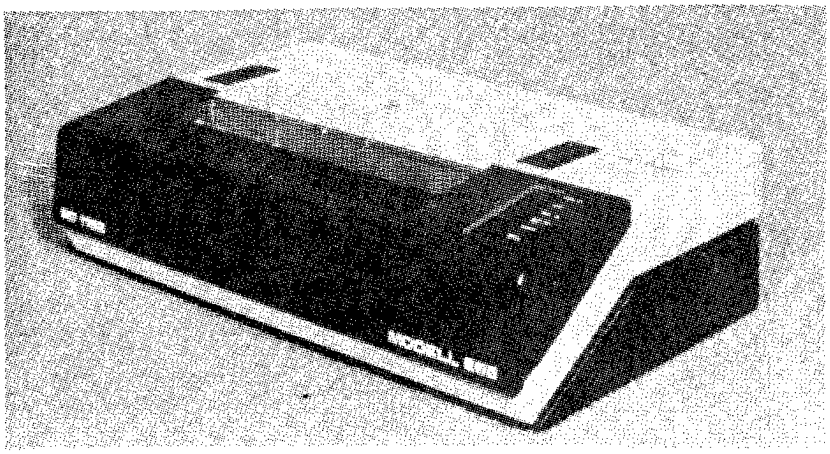

Figure 1. Robotron 1152 serial printer

Robotron 6310 Dot Printers

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 pp 777-778

[Article by Eng E. Hoffmann: "High-Light Dot Printers of the 6310 Series"]

[Text] The Robotron combine, for many years a producer of printing technology, manufactures the 6310 series of high-light dot printers, which with their reliability, quality and flexibility meet demanding requirements in many areas.

The 6310 series printers are marked by the following characteristics:

--slanted lettering, wide lettering, thick lettering,

--bidirectional optimized printing,

--substitutable type sets,

--paper feed by means of barbed or friction platen,

--paper feed from back,

--insertion of individual sheets (indexing in steps or continuously),

--guiding of individual sheets,

--variable and parallel serial interface connectable to all systems,

--favorable cost/performance ratio,

--self-testing.

The printers find application most often in the following areas:

--professional printing industry,

--small computer systems,

--systems for recording of measured values,

--output printers for terminals (available also for special paper feed requirements).

[Technical data, next page]

Technical Data:

	MODEL 6311	MODEL 6312
printing speed	100 characters/sec	100 characters/sec
print speed	9x7	9x7
character spacing	10/12.5/15 cpi	10/12.5/15 cpi
	All characters in double width slant lettering (preset)	
print positions on line	80 char. at 10 cpi	132 char. at 10 cpi
	100 char. at 12.5 cpi	165 char. at 12.5 cpi
	120 char. at 15 cpi	190 char. at 15 cpi
printing direction	forward and reverse optimized printing direction, 6 characters per inch (half-step)	
paper feed	friction/toothed platen (choice)	bands, friction platen (choice)
paper handling	roll	concertina fold, roll
	individual sheet with back insertion (choice)	
	insertion, concertina fold (choice)	
format control	by program	
paper width		
roll	max. 216 mm	max. 375 mm
concertina fold	max. 252 mm	max. 406 mm
color carrier	cassette for spool ribbon (choice)	
number of copies	1 original and 2 copies	
interface	in series: Rs 232 C/V24, in parallel: Centronic	
self-testing	yes	yes
noise level	60 dB (AI)	60 dB (AI)
power feed	220 V, 50/60 Hz	
	110 V, 220 V	
power input	70 W	90 W
dimension (wxdxh)	370x280x130 mm	250x285x135 mm
weight	6 kp	8.5 kp

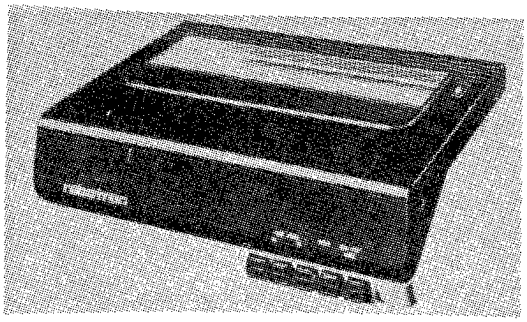

Figure 1. Robotron high-light dot printer

Robotron Read-Record Unit

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 pp 779-780

[Article by Eng E. Hoffmann: "Robotron K 6501 Microelectronic Recording and Reading Unit"]

[Text] The Robotron K 6501 microelectronic reading and recording unit is a peripheral device for storing and reading data on plastic cards or magnetic tape. It finds application in many areas, such as, e.g., services, commerce, postal and transportation services, in industry or in banking. It is produced as a desk-top variant in its own casing, or without it for building into a given system. The K 6501 unit uses as its medium an internationally standardized plastic card provided with a magnetic strip. Depending on the type of application, the recording and reading unit comes in the following variants:

--Robotron K 6501 automatic recording and reading unit for recording/reading of plastic cards during automated card transfer,

--Robotron K 6502 automatic reading unit for reading only of plastic cards during automated transfer of cards,

--Robotron K 6502 reading unit for reading only of plastic cards during manual transfer of cards.

Control and regulation procedures required for exchange of information are performed with the aid of small integrated electronic devices. Information entries on magnetic strips are performed with the aid of asynchronous script DIN 66010.

Dimensions:	length: 272 mm width: 135 mm height: 115 mm
Weight	2.5 kp
Interface	26-pole receptacle
Specifications:	
--type of recording	asynchronous script DIN 66010
--recording code	according to ISO 3434
--information tracks	3 (2 always simultaneous)

--track density	tracks 1 and 3: 76 char. + 3 special ch. track 2: 3.0 bits/m
--memory capacity of card	track 1: 76 char. + 3 special char. track 2: 37 char. + 3 special char. track 3: 104 char. + 3 special char.
--card transport speed	80 mm/s
--length of connecting cable	5 m
--supplementary functions	automatic repetition of reading, input blocking

Usable data carrier:

plastic cards with magnetic strip according to DIN 9785

--dimensions	54x86 mm
--thickness	0.76 mm $\pm$ 0.08 mm
--admissible card displacement	1 mm

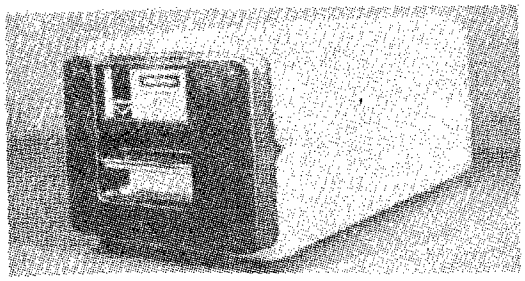

Figure 1. Robotron K 6501 read/record unit

Robotron K 5600 Miniflop Disk

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 p 781]

[Article by Eng E. Hoffmann]

[Text] The Robotron K 5600 miniflop disk is a modern and high-performance memory with low weight and small dimensions. It is used primarily in data processing, in digitally controlled measuring and control technology, in journalistic systems and in peripheral areas of R&D in production of instrumentation.

[Technical Specifications, next page]

Technical Specifications:

type of recording	FM	MFM
memory capacity (not formatted)	125 K bytes	250 K bytes
transmission speed	125 K bytes/s	250 K bytes/s
motor rise time	max. 1 sec	
number of tracks	max. 40	
track density	max. 58 tpi	
diskette rotations	300/min ± 2%	
jump	12 ms	
head alignment	40 ms	
stabilization time	10 ms	
dimensions	141x60x200 mm	
weight	1.5 kp	

Programmer Handbook Reviewed

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 p 798

[Review by A. Halek of book by Danilochkin, V. P., Odintsov, B.V. and G. V. Peledov: Spravochnik programmista po operatsionnoy sistyeme OC EC (Programmer's Handbook for the OC EC Operational System). Finansy i Statistika, Moscow 1982, 288 pages, 16 tables, price R 1.20]

[Text] This book is intended for programmers who work on JSEP 1 [Uniform System of Electronic Computers] and JSEP 2 using magnetic disk units of the types EC 5050, EC 5061 (29 MB) and EC 5066 (100 MB). It defines in outline their distribution systems and macroinstructions. It deals with the problems encountered in use of EC 5566 and EC 5567 (100 and 200 MB) control units. It provides information about operation, monitoring, testing and methods for expedient pinpointing of selected parts and blocks of OS/EC programs. The remarkable arrangement of the contents in almost 2,000 nomenclatures of individual problems encountered in programs of the JSEP 1 and JSEP 2 operational systems makes it considerably easier and faster for the handbook's user to orientate himself and find a requisite chapter in the book. The handbook is registered under No 681.3/D-18 - 146-83 in the scientific and technological library of the House of Soviet Science and Culture in Prague.

USSR Medical Computer Systems

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 p 810

[Article by A. Halek: "New Computer Systems for Medical Purposes in the USSR"; excerpts from articles appearing in PRIBORY I SISTEMY UPRAVLENIYA No 5, 1983 pp 8-10 and in SPUTNIK No 4, 1983 p 139]

[Text] The international exposition Automation 83 in Moscow included some model demonstrations of Soviet and foreign applications of computer systems in medicine. The EC 1055 computer with peripheral equipment, including the ESTEL-4,2 long-distance telephone and radio transmission system, was installed in the Moscow Medical First Aid Center to provide expedient emergency care. The first-aid physician has at his disposal in the ambulance the requisite long-distance transmissions, sensors for blood pressure, ocular background, heart diseases, etc., and by means of a keyboard-type display tube can conduct an active dialogue with the EC 1055 computer into which he can eventually feed directly any information measured on the body of the afflicted or injured person. A physician at the central computer then conducts a long-distance dialogue from his keyboard display or through telephone with the first-aid physician in the field. These systems using the EC 1055 computers are to be used in large Soviet cities.

Another smaller system using the EC 1033 computer is equipped with the ESTEL-4.1 long-distance data transmission system and is destined for use in smaller Soviet cities. Both systems for expedient medical aid are equipped with the program "First Aid."

The Moscow Medical Institute has developed in cooperation with the Finnish KONE company a system for automated cardiogram analysis using the SM-4 minicomputer. Recording during cardiac responses is done by magnetic tape cassette and is transmitted to the center, where it is compared with earlier recordings. Any changes are imaged on the display, recorded by printer and communicated to the physician.

Another new development is the Soviet SM-1803.01 microcomputer for expedient medical prophylaxis--to prevent the spreading of contagious diseases among the populace. It uses the following special peripheral units: PPV-1 pneumoelectronic blood pressure sensor, OFT-1 ophthalmological pressure sensor, L electronic scale, a device measuring human height, etc. Dialogue between physician and microcomputer occurs through a display tube with a keyboard. The software is based on the use of the SM-1800 microcomputer's monitor that was adapted by the VNIINS Institute in Moscow.

Brno 1983 International Exposition

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 pp 831-838

[Text] As in other fields, this year's International Fair in Brno introduced many advanced findings in computer technology and in reprography. Microelectronics was strongly represented by a rich assortment of personal and desk-top computers with a wide range of performance, minicomputer systems, peripheral devices and reprographic systems. The outstanding results achieved in the development of computer technology and reprography are borne out by the gold medal awards,

among the recipients of which, we are gratified to say, were Czechoslovak industry products. The subsequent brief outline introduces some of the interesting exhibits.

CSSR

The exposition stands of Czechoslovak exhibitors presented several attractive new products. The Aritma concern enterprise demonstrated for the fair visitors the first disk memory of Czechoslovak production with a capacity of 100 MB bearing the designation Aritma 4080. It serves primarily for the connection to JSEP [Uniform System of Electronic Computers] computers; recording of information is done by a disk set with 19 working surfaces according to ISO standard. Of no less interest was the SM 6915 system for test processing, which is based on the SM 50/40 microcomputer and comes equipped with a memory using flexible disks and the Robotron 1152 paper-roll printer. The Didigraf 1712 drawing desk produced by the Aritma enterprise in As also attracted interest. Zbrojovka Brno was represented this year mainly by the KDP 723 cassette disk memory with a capacity of 5 Mbytes based on the 721 type (with identical capacity). It also exhibited the Consul 7113 (BC 5074) memory with flexible disk, the Consul 2113 matrix printer with serial interface and a programmable system for data preparation on the Consul 2714 (EC 9053) flexible disk.

Of interest among the computer technology products turned out by the Tesla concern enterprise in Piestany was the PMD 85 compact personal computer with RAM up to 48 K bytes and ROM up to 4 K bytes. It is also equipped with the IMS 2 interface and a graphic version of the language BASIC. In addition to a television receiver acting as display and an acoustic tape recorder acting as external memory, it is possible to connect other devices to it. Another exhibit was the PMI 80 training microcomputer based on the 8080 microprocessor intended for mastering the basics of microprocessor technology. The Tesla concern exhibited also the JPR 1 microcomputer and the system JPR 80.

The center of attention at the exposition stand of the Kovo foreign trade enterprise [PZO] was occupied mainly by systems developed by the VUVT [Research Institute for Computer Technology] in Zilina. The SM 53/10 distributed system is intended for control of technological processes (see a special issue of VYBER devoted to SMEP [System of Small Electronic Computers] problems). The MODUS programming system makes it possible to generate applicational programs for control of technological processes. Among other things, the exhibited system was equipped also with a color display.

Also worth mentioning is the SM 50/50 system and the AGZJ 6432 semigraphic display intended, e.g., for applications in text processing.

The VUVT has developed many new personal and training computers of the SMEP series, Version 1 of the training computer is based on a single-plate microcomputer with the 8080 microprocessor using RAM up to 2 K bytes and ROM up to a maximum of 4 K bytes. Its monitor in EPROM facilitates

operation in machine code mode. It is possible to connect a cassette tape recorder as an external memory and an external display (television set). Version 2, made through expansion, makes it possible, among other things, to expand RAM by 32 K bytes, EPROM by 4 K bytes, and provides a possibility for connecting additional input/output devices and signals.

The SMEP series of personal computers includes three models:

--SMEP 01

based on the 8080 microprocessor, RAM capacity up to 32 K bytes, PROM up to 8 K bytes. It takes on a television set (full graphics 256x256 points), a cassette tape recorder (maximum capacity of 15 K bytes on one side of the C 60 cassette). The computer comes equipped with graphic BASIC.

--SMEP 02

based on the 01 model. The cassette tape recorder is replaced by the KPP 800 memory (maximum of 200 K bytes on one side of the cassette). The system can be further expanded by a led out systemic busbar. MIKROS is used as its operating system. This computer, in view of its modular design, can serve as a basis for devising intelligent terminals and other uses.

--SMEP 03

based on structural elements of the SM 50/40 microcomputer. Maximum capacity of RAM is 60 K bytes, of EPROM up to 4 K bytes. The single unit structurally holds a display unit, two units of minifloppy disk (5.25 inch diameter) with a capacity of 100 K bytes per unit. The keyboard is separate. The computer uses the MIKROS operating system.

Exhibits from among the production of the ZPA [Industrial Automation Enterprise] in Cakovice included the ADT 4500.01 minicomputer that carries on the tradition of this popular series of minicomputers.

USSR

Soviet manufacturers were represented this year once again by many reprographic and computer technology systems. JSEP System users were attracted by the EC 7929.01 display system intended for these computers and also by the exhibited EC 5066 100 Mbyte disk memory. The exhibited SM 2M minicomputer system is intended primarily for technological applications. Reprography was represented by the EL JIK 2, TEKA 11R electric copying machines and the ER 420 R rotary copying machine.

GDR

The exposition stand of the Robotron combine traditionally belongs among the most extensive. Among the most interesting exhibits was the new Robotron 6470 system for digital processing of images that was developed through joint cooperation among facilities of the GDR Academy of Sciences and space

research facilities in the USSR. It involves an interactive system containing devices for image digitalization, image analysis and processing as well as image output. The system is based on the K 1600 microcomputer and uses for interaction on a wide scale a color graphic display unit. Another exhibit was the Robotron A 5130 office minicomputer, which already is in use in our country. It is based on the K 1520 microcomputer with two 8-bit microprocessors. As external memory can serve--in addition to elastic disk (of 8-bit diameter)--a magnetic cassette, standard magnetic tape and the particularly interesting K 5600 memory with a minifloppy disk which uses a flexible disk of 5.25 inch diameter as its memory medium. The memory's capacity is 1 or 2 M bytes, transmission speed at 300 rpm is 125 (or 250) K bytes/sec.

From among the terminals of the 8000 series was exhibited the K 8912 picture tube terminal intended for systems based on the K 1600 microcomputer (the tube displays information in 24 lines with 80 symbols per line, tube diagonal is 31 cm) and also the 8924 bank terminal with a magnetic cassette.

The A 6402 computer system is based on the 1630 microcomputer. It is modular up to 256 K bytes of memory and takes on a considerable array of various peripheral devices (flexible disks, printers, terminals). It uses the MOOS 1600 or LAOS 1600 operating system. Available are FORTRAN, COBOL and BASIC languages. From among an assortment of electronic typewriters with various functions, this year's exhibit was the S 6011 typewriter. It comes with a roller-type printer with printing speed of 17 characters/sec, 1 K byte memory for storing often printed-out texts or for complicated formating. Many formating functions of the machine are automated (e.g., tabulation, centering of text, etc.).

From among printers the Robotron combine offers:

--the 1152 model with a round cassette font, speed 35 char/sec, 132 characters per line;

--the 1157 model matrix printer, speed 180 char/sec, 132 char. per line;

--the FD 40 model thermoprinter, speed in excess of 1 line per second, 40 characters per line.

From among the speech processing system of the 7800 series was exhibited the 7823 speech digitalizer. It is based on the K 1520 microcomputer. It distinguishes approximately 100 different words that it transforms into digital signals. These can be used to perform various functions, e.g., movements of indicator on the display can be controlled by verbal instructions. This system, like some other systems exhibited by Robotron, is described in closer detail in numbers 5 and 6/83 VYBER.

Hungary

The central exhibit in the Hungarian exposition stand was the SM 52/10 computer system. It operates in emulation mode of the SM 3 and SM 4 computers as well as in Videoton mode as a higher output system for the R 11 (the 51/10 processor is approximately 3-4 times faster). Its main memory can be expanded up to 1 M byte capacity with the use of disk memories of 58 M bytes capacity.

Terminals of the new VDN 52 000 Videoton series are controlled by a microprocessor and are suitable for various applications, operational modes and data transmission. An example is the exhibited 52516 asynchronous terminal with 24 lines with 80 characters per line on the display. The VT 201A all-purpose minicomputer is a disk-oriented system (cassette disks 5 M byte, flexible disks) with minimum memory capacity of 64 K bytes. Four other terminals can be connected to the processor. Programming is mainly in BASIC. A hierarchically higher model is the VT 20/IV system which offers considerably greater programming and user possibilities.

Videoton included also a personal computer with an 8-bit microprocessor using two built-in flexible minidisk units (single side recording, 82 K bytes per unit). The 23 600 linear printer attracted attention with its specific character carrier--a metal strip--with a printing speed of 600 lines per minute with a 64 character set.

The 777 desk-top computer of the Hungarian EMG company awarded a gold medal this year is a multiprocessor computer with graphic display, minifloppy disk and the IMS 2 interface. Its RAM memory is modular 16-146 K bytes, 25-line display with 64 characters per line. Programming is in BASIC.

Bulgaria

From the wide spectrum of traditional Bulgarian products, i.e., mainly magnetic tape units and disk memories, particular attention was given to the EC 5067 disk memory with 200 M byte capacity, intended for JSEP 2 computers and, further, magnetic tape units for minicomputer applications: the CM 5300 at feeding speed of 0.3 m/s achieves a transmission speed of 10 K bytes/s, the CM 5303 at 1.16 m/s achieves 36 K bytes/s, the CM 5006 at 2 m/s achieves 63 K bytes/s (at 32 bit/mm) or 128 K bytes (at 63 bit/mm). ISOTIMPEX exhibited ELKA 98 and ELKA 81 electronic cash registers, and systems for data preparation on EC 9004 magnetic tape.

Poland

Of interest among the Polish PZO Metronex exhibits was the RTOS 8 developmental microcomputer system and the compact D 100 printer.

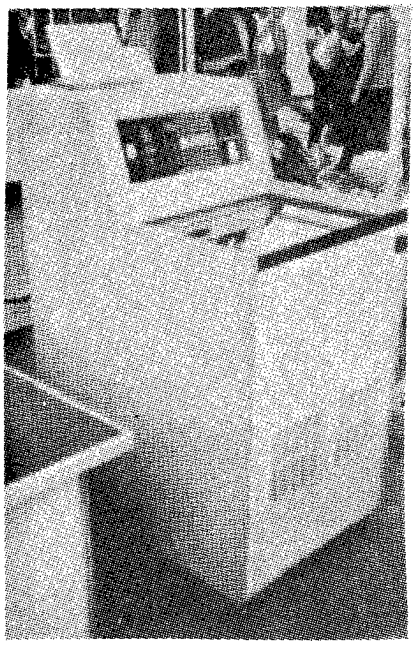

Figure 1. Aritma 4080 disk memory for 100 MB

Figure 2. SMEP 01 personal computer

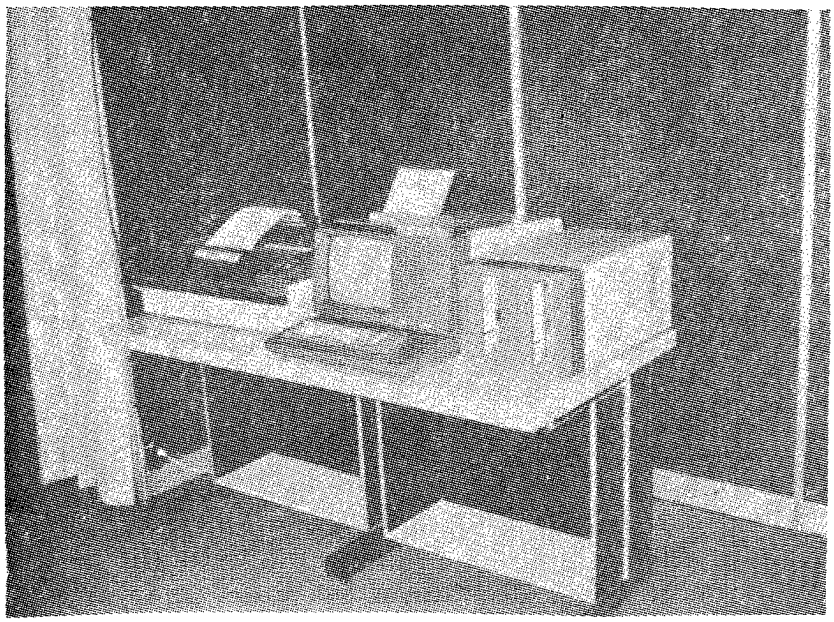

Figure 3. SM 6915 system for text processing of the Aritma concern enterprise

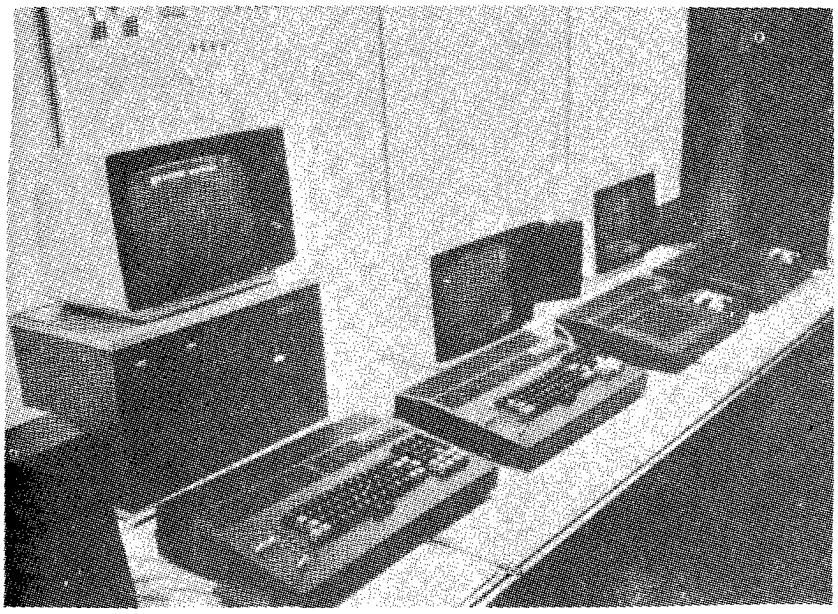

Figure 4. SMEP 02 and 03 personal computers

Figure 5. SM 53/10 distributed hierarchical system with all-purpose Modus software

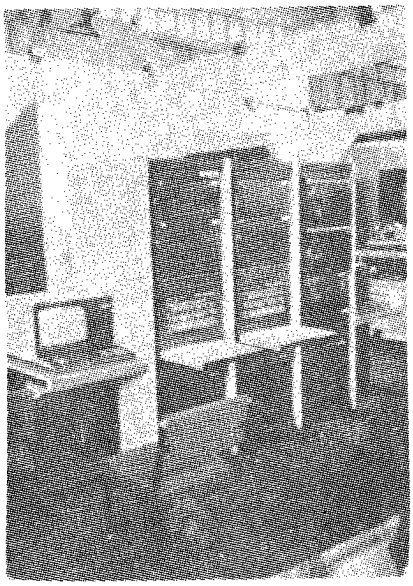

Figure 6. CM 2 M Soviet minicomputer

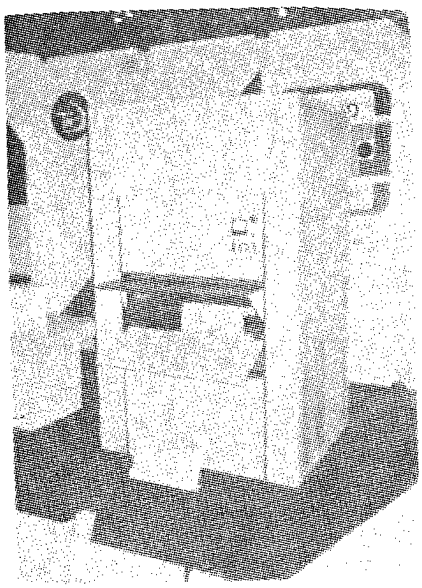

Figure 7. ER 420 R Soviet rotary copying machine

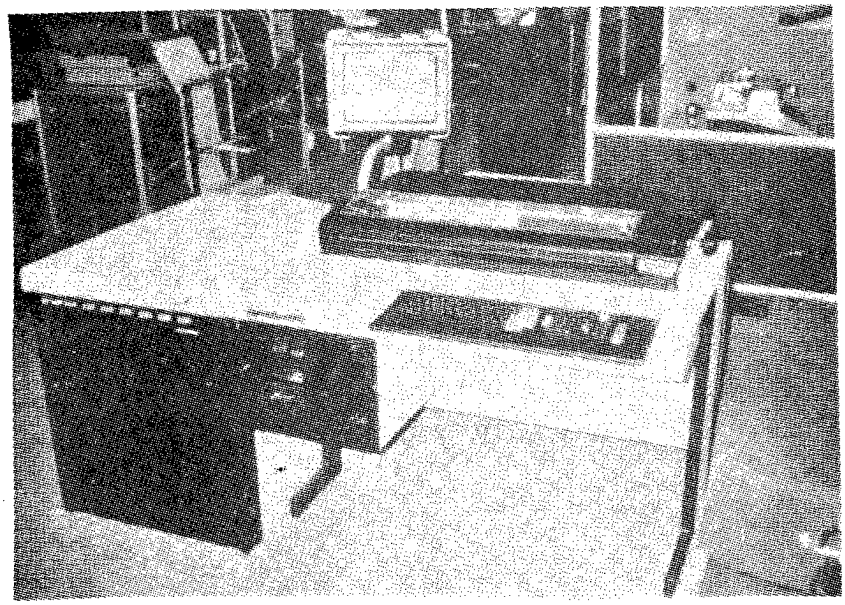

Figure 8. Robotron SM 8907 system

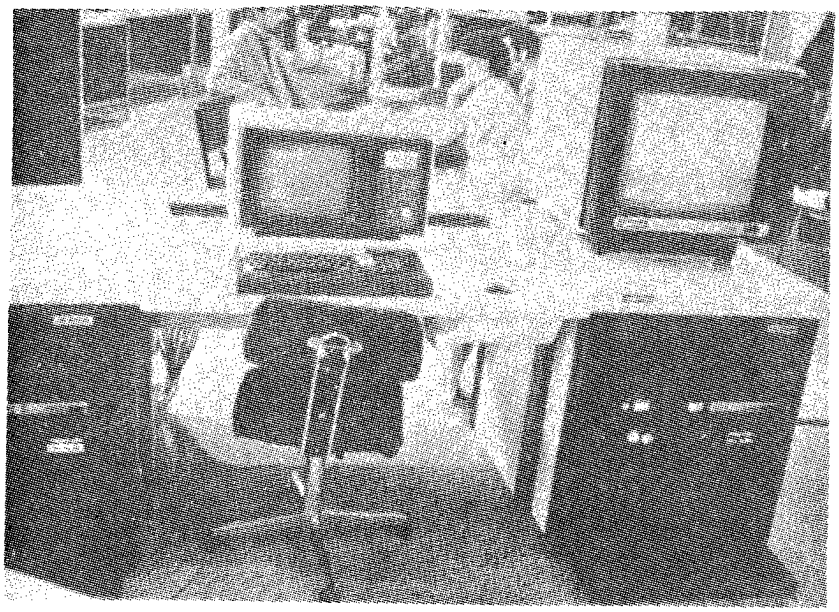

Figure 9. Robotron 6470 image processing system

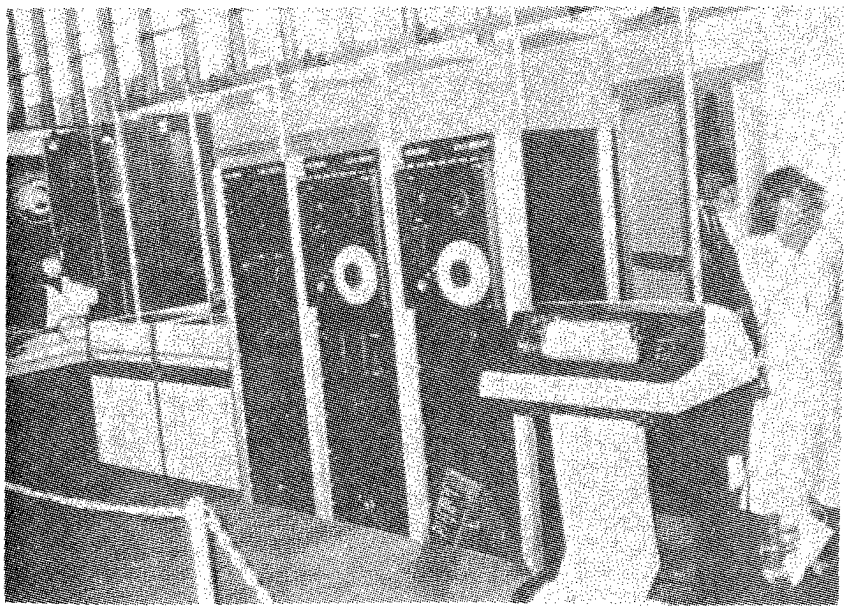

Figure 10. Videoton SM 5210 computer system

Soviet Computer Service Centers

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 p 840

[Article by A. Halek: "Improving Soviet Computer Service Centers"; review of article by V. S. Bespalov: "Programmnoe obespechenie sistemy teleobrabotki dannykh na baze registratorov informatsii," [Software for Remote Data Processing Systems Based on Information Recorders] in UPRAVLYAYUSHCHIE SISTEMY I MASHINY, No 2, 1983 pp 42-44]

[Text] The all-union network of computer service centers in the Soviet Union is undergoing an accelerated expansion together with systematic improvements in the possibilities offered by long-distance transmission attendant to the acquisition and preprocessing of mass and other data. Use is made of new types of RI-7501, RI-7701 and RI-8901 recorders, which are currently finding successful application in systemic sets of ASR [Automated Control Systems]. The introduction of OC EC software's $.1 MVT version is progressing simultaneously. Up to 120 sets of RI-7501 recorders can be connected to a computer service center upgraded in such a manner. The EC-7066 keyboard displays using GAM software are used for programming the input/output operations of the recorders. Improved long-distance data transmission with the use of 30 RI-7501 recorders results in an annual savings of R 100,000.

ENIMS Institute Computer Technology

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 p 843

[Article by A. Halek: "Computer Technology of the Soviet ENIMS Institute"; review of article by V. S. Belov, et al.: "K 50letiyu ENIMSa" ["On the 50th Anniversary of ENIMS] in STANKI I INSTRUMENTY No 5, 1983 pp 4-22]

[Text] Considerable research and development capacities are oriented toward NC- and CNC-type electronic numerical control of machine tools. At the same time the development of control systems using multiple microprocessors, particularly for flexible production systems, is proceeding. These efforts in the Soviet Union are concentrated in the Experimental R&D Institute for Machine Tools ENIMS [Eksperimentalnyi nauchno-issledovatelskiy institut metalloryezushchikh stankov] in Moscow. The first control systems were developed in 1958 with the aid of URAL 2 and MINSK 1 computers. Later came the installation of MINSK 22 and 32 computer systems. Now the institute uses the EC 1022, EC 1033, EC 1055 and SM 4 computer systems. EC 8501M user terminals were installed in individual work centers of the institute for conducting dialogue with the control computer. Increasingly greater attention is now concentrated on the automation of production and assembly lines and on the automation of design documentation. The Elektronika D3-28 microcomputers are used for special and limited developmental activities.

Firm Lists Product Offerings

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 inside front cover

[Text] The Office Machines fiduciary concern organization offers in the area of 16-bit SMEP [System of Small Electronic Computers] using a common busbar the following selections for 1983:

Hardware:

--SM 3-20 minicomputer marketed since 1980
--SM 4-20 minicomputer marketed since 1981
--SM 52/11 minicomputer
--SM 50/50 microcomputer
--ISAP 1 interactive graphic system with SM 4-20 minicomputer
--INDEPENDENT minicomputer from Romania
--SM 4-10 minicomputer from the USSR

Software:

--LOS perforated tape operating system
--FOBOS 1 and FOBOS 2 system operating in real time
--GOLEM and MARKAB acquisition systems for PPPD 1
--VU BASIC and VYUKA multiuser systems
--DOS RV V2 series multiuser multiprogram operating system
--DIAMS 1 and DIAMS 2 multiuser data base oriented operating system
--DOS RVR multiuser operating system with time sharing
--expansion software for individual operating systems
--programming languages
--telecommunication software
--software for graphic systems
--service programs

Information can be obtained from:

Marketing sector representatives of enterprises in Pilsen, Hradec Kralove, Brno, Ostrava, Teplice and from personnel in the marketing sector of the parental enterprise in Prague.

Marketing is provided by: Kancelarske stroje k. u. o. [Office Machines, fiduciary concern enterprise, sector OSVS [expansion unknown], Husitska St. 36, 111 90 Prague 3.

Additional Product Offerings

Prague VYBER INFORMACI Z ORGANIZACNI A VYPOCETNI TECHNIKY in Czech No 6, 1983 inside back cover

[Text] The Office Machines fiduciary concern enterprise offers in the area of 8-bit SMEP [System of Small Electronic Computers] the following selections in 1983:

Hardware:

--SM 50/40 cassette for building into machinery and equipment
--MVS I perforated tape developmental system
--MVS II disk-oriented developmental system
--SM 50/40 microcomputer for a single user
--SM 50/40 programmable terminal
--SM 53/10 distributed system for control of technological processes

Software:

--LOS MVS perforated tape operating system
--DOS MVS disk-oriented operating system
--ERC real time execution for control in real time
--MIKROS single-user operating system
--MUOS operating system for programmable terminals
--software for SM 53/10
--expansion software for individual operating systems
--programming language
--service programs
--cross-programming software facilitating generation of programs for 8-bit systems on 16-bit SMEP computers with a common busbar.

Information can be obtained from:

Marketing sector representatives of enterprises in Pilsen, Hradec Kralove, Brno, Ostrava, Teplice and from personnel in the marketing sector of the parental enterprise in Prague.

Marketing is provided by:

Kancelarske stroje k. u. o. [Office Machinery fiduciary concern organization] sector OSVS [expansion unknown] Husitska St 36, 111 90 Prague 3.

8204
CSO: 8112/1148

END